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WORKING PLAN FOR THE NORTH MANGALORE FOREST DIVISION, MADRAS

BY

P. W. DAVIS, B.A., I.F.S.,
Deputy Conservator of Forests

AND

M. H. KRISHNASWAMY, B.A., M.F.S.,
Extra Assistant Conservator of Forests

UNDER THE DIRECTION OF

C. C. WILSON, I.F.S.,
Conservator of Forests, Working Plans Circle

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MADRAS
PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS

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INTRODUCTION

The first systematic working plan prepared for the forests dealt with under this plan was by Mr. Foulkes in 1902. Most of the prescriptions of this working plan proved ineffective within a few years of its inception and the plan itself became inoperative from about 1918.

A separate division for the forests dealt with hereunder was constituted in 1916 out of the South Kanara Forest Division and during the period 1916–1931 several tentative schemes were prepared and sanctioned by the Conservator, but no effort was made to compile a working plan for the entire division. However, the working of cutch and fuel in Coondapoor Range was throughout based on approved working plans but several modifications in the administration of the fuel forests were tried. Timber fellings in the division were conducted not under any working plan provisions but purely by selection of convenient suitable areas every year by the District Forest Officer to realize the annually budgeted quantity of timber. Nor was there any organized working of the sandal areas of the division. This working plan is compiled for the entire division and an endeavour is made therein to work the forest on as scientific and organized a line as possible at present.

The majority of the timber reserves included in this plan were stock-mapped to vegetational types by the divisional staff and a certain amount of enumeration was also done by them. The results of cruising by the Logging Branch were adopted in one of the timber series. Enumerations and stock-mapping were undertaken by the working plans staff only on a very limited scale as neither the staff nor the time was adequate to undertake a detailed examination or analysis of the forest.

The field work for this working plan was commenced in May 1930 but it was interrupted by the monsoon and by the transfer of the staff to South Mangalore Working Plan. Field work was again commenced in January 1931 and was completed in May 1931.

The following were of assistance in carrying out the field work for this plan :—

Mr. Brown	Assistant Working Plans Officer.
Mr. I. Z. Robert Paul and Mr. T. Perumal Gowndan.	Rangers.
Messrs. K. Poovappa, Madappa and Augustine.	Foresters.

OOTACAMUND,
7th November 1931.

P. W. DAVIS,
Working Plans Officer, North Mangalore

AND

M. H. KRISHNASWAMY,
Assistant Working Plans Officer, North Mangalore.

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PART I

Summary of facts on which the proposals are based.

CHAPTER I.—THE TRACT DEALT WITH.

SECTION 1.—NAME AND SITUATION.

1. The tract dealt with under this plan covers all the forests of the North Mangalore Forest Division, comprising the four ranges of Mangalore, Udipi, Shankaranarayana and Coondapoor.

2. The division is roughly 70 miles long by 35 miles broad. It extends from the boundaries of the Bombay Presidency and Mysore territory on the north, southwards between Mysore territory on the east and the Arabian sea on the west as far as the southern and eastern boundaries of Mangalore taluk and the Charmady ghat road from Punjalkatte to the Mysore border on the south. An isolated area of South Kanara surrounded by the Mysore State, situated above the Kolluru ghats, known as Honnarmagane, is also included under this plan.

3. The entire area dealt with forms part of the South Kanara revenue district, and is situated roughly between 13 and 14 degrees north latitude and 74° 30′ and 75° 20′ of longitude east of Greenwich.

4. The slopes of the western ghats and their foot-hills constitute the great majority of the Government forests dealt with under this plan, there being also a few scattered and somewhat less important reserves nearer the coast. The ghat and foot-hill reserves are situated about 25 to 30 miles from the coast and are roughly in the form of a rectangle about 12 to 15 miles broad. The ghat forests on their northern limits sweep towards the coast. The ghat reserves and the foot-hill portions are generally well wooded, and form extensive contiguous blocks, which cover the catchment areas of the principal rivers of the division. The reserves near the coast are scattered, small and somewhat thinly wooded.

SECTION 2.—CONFIGURATION OF THE GROUND.

5. The topography of the country is very varied and undulating, characteristic of considerable erosion by swift drainage from the steep ghats, through a narrow seaboard, to the Arabian sea. It divides naturally into three sections ; the outer slopes of the western ghats, consisting of one continuous spur broken by deep ravines ; the ' terai ' or foot-hill portions constituting low ridges and a series of broken hills ; and the plains portions extending to a width of about 20 miles comprising the low flat-topped hills surrounded by extensive cultivation on either side of the valleys.

6. The continuous escarped edge of the western ghats with its numerous outstanding peaks is a conspicuous physical feature of the district. The average height of the ghats is about 2,000 feet. Towards the north, the ghats on their western side assume the form of precipitous cliffs. The ' Kudremukh ' group on the south, consisting of three peaks, is the most interesting of all the peaks of the western ghats. There is a bungalow within 20 minutes walk of the peak which is the sanatorium of the district. The elevation of the highest peak of this group is 6,207 feet above mean sea level, known as ' Funk Hill.' Chief among the other peaks is Kodashadri, 4,405 feet high, which overlooks the Kolluru valley and is approached by a bridle path from the top of the Kolluru ghats. Valkunjigudde, 3,408 feet, and Bisale 2,855 feet, are two other prominent peaks. A fairly large double-peaked rock near Mudabidri known as ' Ass's Ears ' is a conspicuous landmark for mariners. The height of this rock is about 1,100 feet.

7. The network of rivers and streams is another characteristic of South Kanara. They necessarily run from east to west and all have their source within 20 miles of the peaks of the western ghats. The rivers are scarcely longer than a hundred miles. Consequent on a heavy annual rainfall of 150 to 200 inches, the volume of water drained from this narrow seaboard during the monsoon is very great, rendering conditions unsuitable for river transport for two or three months. In the dry weather the tidal influence is felt to a distance of 12 to 15 miles up the rivers from the sea, but beyond it, owing to their rocky beds, rivers are not navigable. Within the tidal limits the rivers are extensively used for the transport of grain and forest produce by country boats. The tributaries on the upper reaches of the rivers are torrential.

8. The principal rivers in the area dealt with are the Gurpur, the Gangolli, the Sitanadi and the Swarnanadi.

9. The Sitanadi has its source on the ghats beyond Someshwar, the upper reaches of which are clothed with heavily wooded forests of Someshwar reserve ; it flows in a north-westerly direction as far as the confluence with its tributary in Old Someshwar reserve, then runs in a more or less westerly direction till it finds the Arabian sea conjointly with the Swarnanadi near Hangarkatta, about eight miles to the north of Udipi town. An extensive backwater is formed here. It is navigable up to Kokkarani, eleven miles from the coast.

10. The Swarnanadi takes its rise to the north-east of Kudremukh in Andar reserved forest, and runs in a north-westerly direction till it joins the sea near Hangarkatta. It is navigable up to Baje, a distance of 12 miles from the coast.

11. The Gangolli or Gurget is the name of a combination of streams of importance but of no great size, that form a broad estuary with an interesting landscape to the north of Coondapoor town, entering the sea near Gangolli port. The streams composing it are the Kolluru, Haladi and Chakranadi. Although the course of these streams is very short owing to the narrow seaboard near Coondapoor, the volume of water brought down in the monsoon is considerable. The Kolluru river takes its rise on the ghats to the north of Dhulli and flows in a south-westerly direction, skirting the coast for about eight or nine miles before meeting the Chakranadi at Hakladi. It is navigable to a distance of 12 miles from its mouth. The Chakranadi, which forms the boundary between the Coondapoor and Shankaranarayana Forest Ranges, emerges from the ghats to the south-east of Kodashadri and flows through some of the important reserved forests in a westerly direction till it meets the Kolluru river, three miles from Coondapoor. It is navigable up to Wandse, twelve miles from its entrance to the backwater. The timber from Madibare and the adjoining reserved forests as well as fuel from the reserves round about Wandse are boated to Gangolli port along this river. The Haladi rising in the western ghats near Amashebail runs in a westerly direction till it meets the Kubjanadi, and eventually joins the estuary. Its importance from the forest point of view is great owing to facilities afforded for the cheap transport of timber and fuel from the reserves of Shankaranarayana Forest Range to Coondapoor depot. The tidal influence is felt as far as Haladi, about 17 miles from the mouth of the river, and it is generally navigable up to that place, sometimes even during the dry season.

12. The ghats proper are broken by three passes through which road communications are maintained between Mysore territory and South Kanara. The Agumbe pass, above Someshwar, connects the ports of Coondapoor, Hangarkatta, Malpe and Mangalore with Shimoga and other places in Mysore State. The Hosangadi ghat has direct communication with the Haladi river at Haladi whence river communication up to Gangolli port is maintained. The Kolluru ghat road communicates with the ports of Baindur and Gangolli. All the three ghat roads are fit for motor traffic.

13. The general elevation of the plains is 200 to 350 feet above mean sea level but hills often rise to 1,000 or 1,500 feet.

14. The main aspect is westerly ; but in a mountainous country like South Kanara almost all aspects are represented.

SECTION 3.—GEOLOGY, ROCK AND SOIL.

15. The underlying geological formation is of archaic origin.

16. The ghat portions are principally of gneissic composition, interspersed occasionally by quartzite, micoschists and granite. Outcrops of it occur in long stretches along the scarp edge of the ghats. A peculiar feature about this gneiss is its readiness to decompose into a reddish felspathic clay which after exposure reduces to the hard, brittle substance known as laterite, found extensively all over the plains and foot-hills country. The presence of a large quantity of ferruginous matter is another characteristic of this gneiss. Continued erosion results in the transport of quantities of debris which has become partially lateritized to lower levels, where ferruginous infiltration is continued. Quartz is frequently identifiable in the original rock ; in the foot-hills and to a less extent in the plains, it is found as separate nodules or small crystals.

17. The foot-hill portions are characterised by a soft laterite formed by the decomposition of the original gneissic rock. This brownish friable loam often reaches to a considerable depth and is indicative of the suitability of the soil to support a good deciduous or semi-evergreen forest. The underlying rock is invariably gneiss sometimes outcropping in the form of boulders.

18. In the plains portions the rock is decidedly lateritic. The original rock occurs occasionally in the form of rounded humps or bosses. The low level laterite is the produce of advanced decomposition of gneiss and direct exposure to the sun. Under forest cover it is soft, but on exposure the rock becomes hard, dark, brittle and vesicular in structure, due possibly to chemical changes in the peroxide of iron. Past denudation of forest areas appears to have hastened and accentuated this process. Round about Karkala town there is a fairly extensive sheet of granite or gneiss. The town probably derives its name from "kar kal" meaning "blackstone" or granite.

19. The soil conditions are very variable with regard to quality, depth and consistency. On the ghats the surface soil is a dark or brownish loam of moderate depth, admixed with gneissic or quartzite boulders. Humus and undecomposed vegetable mould are plentiful.

20. The 'terai' portions contain a fairly deep brownish, friable, ferruginous, clayey loam, covered by a moderately thick layer of decomposed and undecomposed vegetable matter, rich in organic constituents.

21. The surface soil in the plains and littoral portions consists of gravel or disintegrated laterite, covering a hard lateritic 'pan'. Near the coast the soil consists of a sandy loam with some gravel. In the neighbourhood of habitations forest soils are much impoverished by the heavy demands by ryots for leaves, both dry and green, as manure. This removal of foliage and leaf humus together with frequent forest fires and consequent rapid leaching off of all organic material seriously reduces the fertility and crop bearing value of the soil.

22. Changes in soil conditions have not an inconsiderable bearing on the distribution of forest types in South Kanara. The impoverished soils of the plains often support only a poor open type of forest fit for working as fuel. On very open and lateritic areas only, *Acacia sundra* and sandal occur. One peculiarity of this kind of soil in the plains is the occurrence of *Hopea parviflora*, frequently in pure patches, on it. Possibly the higher level of the water table in the lateritic plains is a contributory factor to the growth of this species. Although the condition of the soil is not particularly well suited to *Hopea parviflora*, it is not actually deterrent. In such localities the species is confined to moist hill-slopes overlooking or adjoining cultivation.

23. The deep reddish loamy soil, rich with humus, occurring at the foot-hills supports a fairly good deciduous or semi-evergreen type of forest and is capable of supporting good crops of the more important deciduous or evergreen species. Deep loamy soils might with advantage be utilized for raising valuable deciduous species like teak, *Dalbergia latifolia* and *Lagerstroemia lanceolata*. In moist situations the possibilities of introducing *Hopea parviflora* are great.

24. The ghat portions are almost always evergreen or moist deciduous in character. Parts of it, constituting the Someshwar, Andar and Naravi reserves, support a valuable evergreen forest containing species such as *Hopea parviflora, Artocarpus hirsuta, Pœciloneuron indicum, Calophyllum elatum, Dipterocarpus indicus*, etc.

SECTION 4.—CLIMATE.

25. These forests get the full effect of the south-west monsoon which generally breaks towards the end of May or early in June, and lasts till the end of August. The actual burst of the monsoon is generally preceded by local thunderstorms in the months of April and May. The heaviest rainfall occurs in the month of July. Breaks in the monsoon, lasting ten to fifteen days, are not infrequent. In July and August the rivers and water-courses are in full flood and impassable for any kind of traffic. The south-west monsoon abates in September.

26. The north-east monsoon is much less intense than the south-west. Precipitations chiefly confined to the afternoons, occur in the months of October and November. Heavy rain is rare in the latter month.

27. From December to April rainfall is negligible. The dry season commences in December and lasts till the preliminary showers of the south-west monsoon arrive. These months are sultry and marked by fairly high temperatures. The ghat and foot-hill portions of the district are malarious during this season, and this condition is intensified by the scarcity of water in the localities of Someshwar, Amashebail, Hosangadi and Kolluru.

28. The average rainfall of the district is 145 inches which is considerably more than in any other district in the Presidency. Severe drought is almost unknown in South Kanara. Cultivation relies solely on natural irrigation from springs and watercourses.

29. The following table gives the average rainfall of the district as a whole. There are no forest rain-gauge stations in the district. The rain-gauge stations at Coondapoor, Karkala and Baindur are maintained by the Revenue Department. The foot-hill and ghat portions of the district receive more rainfall than stations adjoining the coast.

Rainfall statement of South Kanara.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1900 ..	..	..	..	0·63	0·57	46·97	55·64	27·57	16·87	4·79	0·49	0·42	153·95
1901 ..	0·14	0 05	0·74	2·86	4·96	46 09	42·36	25·12	6·50	5·96	8·31	1·23	144·32
1902 ..	0·18	0·03	0·25	0·57	3·85	29·27	65·09	22·23	34·20	6·75	3·29	4·74	170·45
1903 ..	0·07	..	..	0·12	9·21	24·10	61·19	26·06	15·82	11·44	4·74	0·32	153·07
1904 ..	0·18	..	0·09	0 96	4·85	47·91	49·12	18·77	12·47	6·77	0·13	..	141·25
1905 ..	..	..	..	0 09	4 93	41·93	39·40	27·91	8·26	12·15	2·16	..	136·83
1906 ..	0·91	..	..	0·01	2·53	27·27	54·86	26·52	12·43	6·61	1·49	2·12	134·75
1907 ..	0·39	..	0·35	4·04	1·12	37·20	49·06	49·53	8·05	5·19	3·70	0·96	159·59
1908 ..	..	0 20	0·01	2·25	2 64	35·75	85·88	35·31	5·75	3·10	0·04	..	170·93
1909 ..	0·28	0·08	0 02	0·21	15·12	43·13	55·40	16·10	11·33	3·63	2·66	0·52	148·48
1910 ..	..	..	0 13	0 50	2·29	47·73	26·38	32 40	19·52	8·14	4·67	..	141·76
1911 ..	..	..	..	0 06	3·59	41·13	36 55	24 62	4·93	9·24	2·24	1·26	123·62
1912 ..	0 08	..	0·02	0·75	3·37	40·31	50·91	42·28	6·74	14·62	2·83	0·04	161·95
1913 ..	..	..	..	0·66	3·83	37·72	42 63	17·97	8·58	13 58	0·48	0·48	125·93
1914 ..	..	..	..	0 02	2·39	34 54	63·38	40·47	13·74	8·67	5·23	2·52	170·96
1915 ..	..	0·12	0·03	1·78	3·38	34·36	39·58	16·30	12 38	7·75	6·35	0·10	122·13
1916 ..	..	..	..	0·83	4·81	52 63	27·22	27 03	23·75	9·76	7·57	0·01	153·61
1917 ..	..	1·30	0·22	0·50	3·27	54·45	34·16	27·00	18·20	14·50	2 64	..	156·24
1918 ..	0·15	0·26	0 22	0 23	34 89	30 73	14·57	21·09	5·73	3 38	8·59	1·25	121·09
1919 ..	..	..	..	0·10	4·42	31·13	44 84	28·89	10·91	10·90	6·66	0·54	138·39
1920 ..	0 06	..	..	3·16	1·58	44 88	50·07	23 61	7·17	5·12	3·42	..	139 07
1921 ..	0·15	0·03	0·11	1·48	5 01	39·22	47·84	27·80	12 36	8·58	2 89	0·61	146·08
1922 ..	0·15	0 03	0 11	1·48	5·01	39·22	47·64	27·80	12·36	8 58	2 89	0·61	146·08
1924 ..	0·14	0·07	0·10	1·43	5·71	39·65	45·91	27·51	12·45	8·65	3·27	0·58	145·47
1925 ..	0·14	0 07	0·10	1·43	5·71	39·65	45·91	27·51	12·45	8·65	3·27	0·58	145·47
1926 ..	0·58	0·31	0·01	0·63	0·72	33·81	43 59	32·53	10 56	10·05	0·47	0·01	133·27
1927 ..	0·14	0·07	0 11	1·43	5·71	39·65	45·91	27·51	12·45	8·65	3·27	0·58	145·48
1928 ..	0·13	0 07	0·10	1·43	5·71	39 65	45·91	27·57	12·45	8·47	3·27	0·58	145·34
1929 ..	0 13	0·07	0·10	1·43	5·71	39·65	45 91	27·51	12·45	8·65	3·27	0·58	145·46
1930 ..	0·13	0·07	0·10	1·43	5·71	39 65	45·91	27·51	12·45	8·65	3·37	0·58	145·56
Total ..	**4 13**	**2·83**	**2·92**	**32·50**	**162·60**	**1,179·38**	**1,403·02**	**830·03**	**373,31**	**250·98**	**103·66**	**21·22**	**4,366·58**
Average ..	**0·14**	**0·94**	**0·97**	**1·08**	**5·42**	**39·31**	**46·76**	**27·66**	**12·44**	**8·36**	**3·45**	**0·70**	**145·55**

30. The plains portion between the ghats and the coast has an equable humid climate throughout the year. The temperature varies from 70 to 95 degrees Fareinheit near the coast but at the foot of the ghat a wider range of temperature is experienced owing to land currents which descend from the plateau above the ghats.

Month.	Temperature.	
	Maximum.	Minimum.
January	89·2	69·9
February	88·5	72·1
March	89·7	75·1
April	91·8	78·3
May	91·2	78·5
June	85·2	74·5
July	84·0	74·1
August	83·6	74·0
September	84·3	74·1
October	85·9	74·4
November	87·6	73·4
December	88·9	70·4

The seaboard enjoys the full effect of the sea breeze during the hot weather. Preceding the south-west monsoon, in the months of April and May a south-westerly wind is experienced indicative of the gathering of the oncoming monsoon.

SECTION 5.—WATER-SUPPLY.

31. Reference has already been made under the previous section to the scarcity of water in the ghat and foot-hill parts of the district during the summer months, but forest stations situated therein, are provided with wells, which generally contain an adequate supply of water to meet the domestic requirements of the staff. The plains have an ample supply of water throughout the year from the large rivers, streams and wells. Many of the smaller streams on the upper reaches of the rivers are seasonal but, in summer, water is obtainable in small holes along the stream beds.

SECTION 6.—DISTRIBUTION AND AREA.

32. The total area of the reserved forests in the tract dealt with including the area of the two reserves transferred from South Mangalore Division owing to the abolition of Beltangady Forest Range, is 263,172·70 acres or roughly 411 square miles, distributed among the four ranges as follows :—

	ACRES.
Mangalore	62,822·88
Udipi	69,657·15
Shankaranarayana	50,223·53
Coondapoor	80,469·14

A list of the reserves included in this working plan together with their areas is furnished in the statement that follows (Section 8, Legal Position).

33. With the exception of the two reserves Pilarkan and Jarvattukadu the timber areas of the division form a more or less contiguous block running north to south with the Mysore frontier as its eastern boundary. The following are the more important timber reserves of the division :—

		ACRES.
1	Hullumurudubare	5,472
2	Koraticalbare	5,507
3	Megany Valley	13,828
4	Madibare	16,824
5	Mukodihola	749
6	Gundaberpare	1,936
7	Mudugalpare	5,813
8	Nagankalpare	4,892
9	Baregundy	7,628
10	Doddinamane	3,322
11	Mettukalgudde	5,023
12	Tombattu	12,254
13	Surikodlu	2,624
14	Ballimane	11,068
15	New Someshwar	2,477
16	Old Someshwar	2,095
17	Mavinkodlu	1,416
18	Jatkatmale	1,294
19	Someshwar	26,656
20	Andar	19,746
21	Naravi part	23,000
22	Pilarkan	307
23	Jarvattukadu	375
	Total ..	174,306

The scattered reserves along the coast are poor in quality, fit only for the production of fuel, sandalwood and cutch.

SECTION 7.—STATE OF THE BOUNDARIES.

34. The number of scattered small reserves along the coast, the system of allowing privately owned cultivation adjoining, or included as enclosures within, reserved forests, and the exercise of the peculiar right of 'kumaki', have inevitably necessitated the creation and maintenance of very lengthy, and often complicated, artificial boundaries for forest reserves in South Kanara. Forest boundaries are generally indicated by cut lines extending to a width of about 12 to 18 feet with cairns of rough stones built at intervals along them. At the time of original forest settlement permanent demarcation of forest boundaries was attempted in some reserves, by trenching, or lining with stones ; this method was abandoned owing to the exorbitant cost of the operation. The boundary between Kanara and Mysore is indicated by cleared lines 10 feet wide, and rough stone cairns along the boundary. It is divided into three sections ; every year one section is cleared and fire traced and inspected by the District Forest Officer. His report on the maintenance of the boundary was satisfactory except for minor defects noticed at the time of inspection which were subsequently rectified by the subordinates responsible. (Boundary line clearing on the Mysore side is seldom done.) The maintenance of other reserve boundary lines is satisfactory. Most of the lines are annually cleared by the subordinates in charge but in remote inaccessible localities this work is often left in arrears. A few lines are cleared under sanctioned estimates at the time of fire-protection.

SECTION 8.—LEGAL POSITION.

35. Until the beginning of the nineteenth century, the claims of private proprietors to forest land, as recognized in Malabar, were also thought applicable to South Kanara. Large forest areas were spoken of as forming part of estates and up to 1844, these were recognized by the early British administrators by the grant of 'mulpattas' by which full proprietary rights over forest and waste lands, were defined and assigned. The boundary of a 'mulpatta' was usually the crest of the hill overlooking the valley. In 1822 Government, while calling for a list of Government forests in the district, ordered, that a margin of 100 yards was to be excluded from the reserve as 'kumaki' (meaning 'aid'), when a Government forest adjoined a cultivation. Originally this 100 yards limit was not rigorously adhered to; the ryot had the use of the forest land up to the 'nettikat' (crest of the hill overlooking the cultivation) for his cultivation purposes. From 1839, after the assertions of proprietary rights of Government over forest land up to the 'nettikat', 'kumaki' was understood as a semi-proprietary right within 100 yards of all cultivation, while the right up to the 'nettikat' consisted merely in the usufruct of the hill for grazing and collection of manure leaves. Strict conservancy was not, therefore, enforced while Government was gradually establishing its proprietary rights over forest land up to the 'nettikat.'

36. 1874 while admitting the exercise of complete proprietary rights over privately owned forest land, the demarcation of valuable forests, admittedly the property of Government, was considered. The Forest Act was passed in 1882. It was made clear then that only a very small portion of the forest land of South Kanara had any legal claim to be considered as private forest, whereas the bulk of the forest land was deemed the property of Government, subject only to admitted rights of way and water, and certain rights to pasture and forest produce, over portions adjoining private holdings. Accordingly after preliminary notification forest settlement was laboriously undertaken and the existing reserved forests were notified progressively during the period 1885 to 1900 under Section 16 of the Forest Act. A few additions and reserves have been formed subsequently. All the forests dealt with under this plan are, therefore, the absolute property of the State.

37. Copies of Section 16 Notifications relating to each reserve, with subsequent changes if any, are posted on separate pages in the register of reserves maintained in the District Forest Office. The original settlement maps of the reserves are kept in safe custody in the Collector's office; it would be useful to keep copies of these maps in the District Forest Office for purposes of verification of boundaries.

38. The following statement shows particulars regarding name, number, distribution, and the date and number of Government Order notifying them as reserved forests under Section 16:—

Serial No.	Reserve No.	Name of reserve.	Area in acres.	Notification. G.O. No.	Notification. Date.
		MANGALORE RANGE.			
1	12	Hosabettu	468·50	510	20th July 1888.
2	81	Hurabe	607·40	522	4th August 1899.
3	92	Kodialmale	666·90	253	18th March 1905.
4	87	Kodyamale	1,108·33	862	23rd December 1899.
5	13	Mujimale	1,429·80	316	14th April 1891.
6	91	Nananjimale	1,443·80	765	11th November 1899.
7	..	Naravi Part	22,794·15	99	6th February 1900.
8	..	Naravi extension VI	24·00	545	16th September 1914.
9	90	Panamberi	601·60	1072	17th October 1900.
10	11	Todar	401·30	764	23rd September 1890.
11		Naravi (transferred from South Mangalore)	28,411·10	..	
12		Charmady Kannapady Part (transferred from South Mangalore)	4,866·00	..	
		Total	62,822·88		
		UDIPI RANGE.			
13	15	Andar	19,459·90	26	15th January 1891.
14	15-A	Andar extension I	261·80	..	
15	182	Do. II	25·00	3555	27th December 1909.
16	8	Chinkramale	2,064·60	415	14th June 1888.
17	84	Do. extension I	684·20	333	26th May 1899.
18	183	Do. Do. II	8·30	928	2nd April 1909.
19	14	Durgamale	1,355·70	362	28th November 1889.
20	111	Do. extension I	5·10	930	3rd April 1909.
21	55	Hale-Someshwar	2,095·30	129	19th January 1907.
22	52	Jarvathukadu	375·00	81	30th January 1899.
23	62	Jettukattumale	1,294·70	370	13th June 1899.
24	6	Manajekadu	386·60	363	22nd May 1888.
25	53	Matkalgudde	291·80	71	26th January 1899.
		Total	28,308·00		

UDIPI RANGE—*cont.*

Serial No.	Reserve No.	Name of reserve.	Area in acres.	Notification. G.O. No.	Notification. Date.
26	71	Mavinakodlu	1,416·40	664	29th September 1899.
27	88	Menasinakana	883·80	320	19th May 1899.
28	..	Naravi	8,038·95		....
29	..	Do. extension IV	4·50	202	3rd March 1905.
30	207	Do. do. VII	13·60	464	31st October 1917.
31	211	Do. do. VIII	8·30	412	14th March 1921.
32	75	New Someshwar	2,477·40	129	19th January 1907.
33	111	Nire	663·70	895	28th September 1901.
34	1	Pilarkan	307·20	79	19th January 1885.
35	74	Someshkar	26,653·30	416	4th May 1900.
36	112	Do. extension	2·60	394	17th May 1901.
37	115	Vorwadi	879·40	289	27th March 1905.
		Total	69,657·15		

SHANKARANARAYANA RANGE.

Serial No.	Reserve No.	Name of reserve.	Area in acres.	Notification. G.O. No.	Notification. Date.
38	59	Bakudihola		254	22nd April 1899.
39	134	Do. extension I	861·55	1751	12th July 1907.
40	187	Do. do. II		2891	1st September 1910.
41	30	Balkattehole	339·80	658	8th November 1898.
42	69	Bellimane		1035	10th October 1900.
43	122	Do. extension I	11,068·40	921	20th August 1904.
44	136	Do. do. II		49	20th January 1905.
45	..	Do. do. III		3224	10th November 1914.
46	76	Baregundi	7,627·80	11	5th January 1899.
47	58	Doddinamane	3,288·30	287	6th December 1899.
48		Do. extension I	33·60	90	25th February 1920.
49	88	Dottinaberu	443·50	445	13th August 1898.
50	29	Halakkihola	698·90	790	23rd October 1899.
51	35	Jarkal Ane	350·10	243	18th April 1899.
52	45	Kamradihola	760·90	623	27th October 1898.
53	79	Mavinaguli	1,225·60	508	1st September 1898.
54	46	Mettukalgudde	5,022·80	128	18th February 1899.
55		Do. extension I		2351	17th December 1919.
56	1	Sabladi	208·00	613	8th May 1884.
57	38	Suraladvi	526·70	1020	6th December 1897.
58	68	Surikodlu	2,624·60	156	3rd March 1899.
59	36	Surtihola	330·20	243	18th April 1899.
60	67	Tombattu	11,996·60	570	29th August 1899.
61	136	Do. extension I	246·00	327	10th April 1905.
62		Do. do. II	11·80	762	26th March 1915.
63	34	Vadanberu	359·10	724	28th November 1898.
64	7	Tenkahola	2,194·70	317	14th April 1891.
65	115	Do. extension	4·58	116	15th July 1905.
		Total	50,223·53		

COONDAPOOR RANGE.

Serial No.	Reserve No.	Name of reserve.	Area in acres.	Notification. G.O. No.	Notification. Date.
66	16	Kasankatte	263·90	1181	28th November 1892.
67	21	Korakoppadahola	405·80	359	1st May 1893.
68	64	Koratikalbare	5,507·20	257	22nd April 1899.
69	66	Kursegudde	2,186·90	105	19th February 1898.
70		Do. extension I	0·29	88	25th February 1920.
71	63	Madibare	16,752·00	223	2nd April 1899.
72		Do. extension I	34·00		
73		Do. do. II	38·00		
74	65	Megany Valley	13,828·20	539	12th August 1899.
75	29	Menasinagudde	397·60	319	19th May 1899.
76	32	Mudarigudde	332·80	522	10th October 1896.
77	39	Mudugalpare	5,800·40	556	28th September 1898.
78		Do. extension I	13·40	2672	16th September 1914.
79	60	Murkodihole	723·20	984	24th November 1897.
80	184	Do. extension	26·25	826	25th March 1909.
81	41	Nagankalbare	4,892·80	675	14th November 1898.
82	40	Nujin Ane	638·70	7	5th January 1898.
83	57	Sarpanamane	488·80	363	24th July 1896.
84	85	Savanthagudde	309·10	725	28th November 1898.
85	18	Talabur Ane	583·00	359	1st May 1893.
86	13	Abbigudde	1,255·70	230	4th June 1896.
87	174	Do. extension	25·60	2476	5th October 1907.
88	78	Baindur	3,635·20	251	22nd April 1899.
89		Do. extensions I and II	7·00	3336	17th November 1913.
90	54	Chittur	1,781·10	654	7th November 1898.
91	25	Darlegudde	167·00	522	10th October 1896.
92	19	Gunderberupare	1,936·60	274	5th April 1893.

Serial No.	Reserve No.	Name of reserve.	Area in acres.	Notification. G.O. No.	Date.
		COONDAPOOR RANGE—*cont.*			
93	28	Guruvanacote	1,481·60	230	4th June 1896.
94	47 & 49	Honnarmagane Block	1,700·80	482	24th July 1899.
95	17	Harkur	815·40	14	10th January 1893.
96	22	Harmannu	596·50	195	9th March 1894.
97	23	Herur	2,795·50	9	5th January 1898.
98	33	Honnakodlu	541·40	522	10th October 1896.
99	24	Hulimishipare	1,975·00	490	29th August 1898.
100	27	Hullumurudibare	5,472·00	205	27th March 1899.
101	20	Jennal Ane	666·20	247	20th March 1893.
102	55	Kadike	1,569·90	230	4th June 1896.
103	56	Karnigudde	824·30	230	4th June 1896.
		Total ..	80,469·14		

SECTION 9.—RIGHTS AND CONCESSIONS.

39. The rights admitted at the time of settlement and those granted subsequently by the District Forest Officer, include rights of way and rights to divert water for purposes of cultivation, from forest streams, either free, or on payment of a nominal annual fee.

40. Free removal of leaves and shrubs of unclassified species for litter and manure was allowed in the Baindur reserve of Coondapoor Range from 1900 to 1921. For this purpose the reserve was divided into four coupes and the concession was permitted in one coupe every year.

41. Until 1916–1917 removal of dry leaves as manure was granted on permits in Sarpanamane, Savanthagudde, Kadike, Karnigudde, Guruvanacote, Herur, Kursegudde, Honakodlu and Hulimishipare reserves. From 1917 to 1922 the above concession was annually leased out.

42. In 1921 Government stated that entire prohibition of the removal of manure leaves from reserves, was their ultimate aim ; but, considering the hardships that would result if this policy were enforced immediately, they suggested that a gradually increasing rate of seigniorage should be levied so that in course of time the ryots would find the fees prohibitive.

43. On the recommendations of Mr. Tireman, then Conservator of Forests, the Chief Conservator in his letter No. 1206/21-2, dated 13th September 1922, directed that as an experimental measure the following concessions and privileges would be allowed in the forest reserves of South Kanara until the end of June 1923 :—

(1) Clearing undergrowth in all reserves except those near the coast to a width of half a mile from the limits of private holdings.
(2) Clearing undergrowth in all areas sown with *Hopea parviflora*.
(3) Free collection and removal from all reserves of :—
- (*a*) manure leaves of unclassified species,
- (*b*) dead timber of unclassified species,
- (*c*) dead fuel, and
- (*d*) clay.

The following conditions were also imposed :—

(1) If the concessions were abused they were liable to be withdrawn ;
(2) the forests wherein concessions were granted should not be burnt ; and
(3) in case of any accidental fire in the forest the villagers should help in putting it out.

Exercise of the above concessions was not extended to Pilarkan and Sablady reserves.

44. In 1924 the Chief Conservator re-notified the grant of the above concessions for one year from 1st August. Modifications were made, consisting in allowing the clearance of undergrowth to a width of 200 yards in coastal reserves, in limiting the size of dead fuel to 3 inches diameter, and in defining undergrowth as growth of unclassified species not above 6 feet in height. District Forest Officers were ordered to submit annual reports on the working of the concessions.

45. The District Forest Officers' annual reports reveal that the concessions were largely abused in the years 1925 and 1927 in the coastal reserves of Coondapoor Range. The abuses consisted in the removal of leaves of classified species, and in cutting green branchwood for fuel, which was left to dry in the forest before removal. The Chief Conservator of Forests ordered the Conservator to examine the question of continui the concessions in South Kanara.

46. Mr. Minchin, Conservator of Forests, inspected the reserves where the concessions are most exercised and submitted an exhaustive note containing the following remarks and recommendations :—

(*a*) The exercise of concessions had resulted in serious damage to classified species in reserves nearest to wet cultivation.

(*b*) Effective protection, especially with a small staff, expected to control extensive forest areas, was incompatible with the exercise of concessions in reserves where they are much abused.

(*c*) There had been a lack of restriction in the cutting of manure leaves.

(*d*) The concessions were unsound and should be withdrawn after making adequate provision for meeting local needs for manure leaf and fuel.

47. The Chief Conservator of Forests extended the continuance of the concessions up to end of June 1929. At the same time he ordered the District Forest Officer to inspect the reserves wherein the concessions were most abused and to make suggestions for meeting the demands by other suitable arrangements ; also to examine into the possibility of handing over arears outside fuel coupes to panchayat management. After examining the question in great detail the District Forest Officer reported that he was not in favour of handing over the areas outside fuel series to Panchayat management, as he apprehended that such a procedure would affect the cutch operations in the district, and that as a result of indiscriminate fellings over the area handed over, further demands for disforesting fresh areas would be made by the people. To meet the demands for leaf manure by other suitable arrangements the District Forest Officer made the following suggestions in his reference 2053/F. 29-C-1, dated 7th March 1929:—

(1) Entire abolition of the concessions.

(2) Imposition of a high rate of seigniorage on collection of manure leaves.

(3) Strengthening the existing protective staff.

(4) A large number of more evenly distributed fuel series.

(5) The formation of a leaf manure working circle outside the fuel series, on a four year felling cycle, annual coupes to be leased out for collection of manure leaves of all species, up to three inches in girth.

48. The District Forest officer in his report on the working of the concessions in 1930 again reiterated on severe abuse in some of the coastal reserves, and recommended the gradual withdrawal of the concessions. In his forwarding note to the Chief Conservator of Forests, the Conservator remarked that the concessions were unnecessary and undesirable, but in view of the fact that Government conceded to the continuance of the concessions only recently, entire abolition was unjustifiable. On this the Chief Conservator has ordered the Conservator to again go into the question in deatail and submit a report in January 1932.

49. In addition to damage to tree growth, the actual exercise of the concessions results in the continual depletion of the organic constituents of the soil so necessary for good forest growth. Where the concessions are most abused the damage is greatly accentuated. While entire abolition of concessions would eventually become imperative, in view of the hardship that would be created on the people if they are withdrawn suddenly from all the reserves, it is suggested that the withdrawal should be gradual. A commencement may be made by withdrawing the concessions from reserves where they are most abused at present.

CHAPTER II.—THE FOREST.

SECTION 1.—COMPOSITION AND CONDITION OF THE CROP.

50. The occurrence of a variety of vegetational types or plant associations in South Kanara renders, any attempt at furnishing a comprehensive description of the flora of the district as a whole, difficult, without giving a detailed description of the several types met with in the district. The numerous species constituting the forest flora of the district, their distribution in widely varying conditions of locality, and the number of external factors, both natural and accidental, to which tree growth is frequently subjected, all these factors, contribute to the complexity of forest types found in the division. Observations in the field combined with a study of the past history of the forests, indicate that the South Kanara forests were originally largely evergreen. The existence of an evergreen type of forest with heavy tree canopy in private ' kumakis ', in contrast with the degraded fire-burnt forest areas adjoining it, corroborates the above surmise. Further instances are not lacking, to show that with continued protection the general tendency of the deciduous forests of the district is to revert to an evergreen association in gradual stages. Therefore, a large proportion of the forests are now in a transitional stage from deciduous type

to a moist or semi-evergreen association. This process of transformation into an evergreen type is considerably accelerated by the favourable climatic conditions prevailing in the district. The system of treatment adopted in the past is largely responsible for retarding the natural process of transformation. Continuous denudation of extensive timber bearing areas on the ghats as well as along the foot-hills in the past; by the practice of shifting cultivation—kumri—while altering the original type of evergreen forest, has greatly promoted the secondary regrowth of deciduous species. But it is doubtful if the converse process of changing the scrub type into an evergreen association can ever be so rapid under natural conditions. Evidence goes to show that the general tendency of the poorer types of forest is towards evergreen. Consequently, almost all types of forest from scrub jungle (the result of continuous denudation of timber bearing areas) to pure evergreen, often virgin forest undisturbed by any external agency, occur in the district.

51. In localities subject to abnormal openings in the tree canopy, undesirable shrubby growths, such as Strobilanthes, Lantana and species of Graminae have taken exclusive hold of the soil. In such places, which are not very extensive, it is almost impossible to effect the change from deciduous to evergreen unless concentrated artificial measures are undertaken.

52. Therefore a variety of vegetational types, one frequently merging into another at every stage of transition from deciduous to evergreen is a characteristic feature of the flora of South Kanara.

Factors influencing types.

53. (*a*) *Soil, aspect and climate.*—Forest soil in South Kanara is only occasionally suited for the production of first class timber comparable with the forests of Malabar. The soil is subject to considerable depletion by annual erosion. On weathering and exposure it becomes hard and lateritic and inimical to good tree growth. Climatic conditions however, favour the production of a heavy and luxurious vegetation which, left undisturbed, provides a natural protective covering to the soil. In the plains poor lateritic soils are characterised by open, degraded tree growth, while fairly deep soils often support a dense fuel forest. Deep loamy soils along the foot-hills contain some of the good deciduous forests of the district, and the dark gneissic soils on the ghats support an evergreen type.

Changes in aspect are almost invariably associated with modifications in the type of forest growth. In the ghat region cool, protected, northerly slopes produce a heavy evergreen type, whereas exposed southerly aspects support moist deciduous or semi-evergreen types. Along the foot-hills changes in aspect are signified by a corresponding transformation in the ground flora ; cooler northern aspects contain a moist or evergreen undergrowth, while southerly aspects are generally deciduous.

54. (*b*) *Kumri.*—The chief external factor in the past affecting the determination of forest type was the system of shifting cultivation—kumri—practised throughout the district from time immemorial. The practice consisted in selecting the richest evergreen or moist deciduous areas of the ghat and foot-hill portions, clear-felling and burning the debris in the hot weather, and raising a catch crop or two, subsequently abandoning the areas in quest of fresh suitable ones. Kumri practice on southern slopes had a most drastic effect in changing the evergreen type into a deciduous or semi-evergreen type overrun with thorny climbers and shrubs ; but on northern slopes the reversion has been to an evergreen type devoid of valuable species.

55. (*c*) *Fire.*—Forest areas adjoining cultivation are the most susceptible to annual fires. Very often a fringe of reserved forest adjoining cultivation consists of scrub or a degraded type of deciduous timber forest, overrun with grass, lantana, or thorny xerophytic shrubs ; while remoter parts of the reserve, being less exposed to constant fires contain fairly good deciduous forest. Fire swept areas are generally devoid of dense undergrowth. This renders them vulnerable to subsequent fires, and further degradation, and is the general condition of the plains reserves ; in the less thickly populated regions of the ghats and foot-hills, evergreen undergrowth offers considerable resistance to chance ignition so that the essential character of the vegetation is rarely destroyed.

56. Fire protection in the past has resulted in the rehabilitation of many blank areas firstly with adaptible species, such as *Anacardium occidentale, Careya arborea, Phyllanthus emblica,* etc., which are succeeded at later stages by other tree species. The growth of an evergreen ground flora in a deciduous forest is slow in the first instance but afterwards rapid. One result of this transition is that natural regeneration of deciduous species is largely prevented. Small sized evergreen trees make their appearance, viz, *Aporosa Lindleyana, Olea dioica, Ixora parviflora, Limonia acidissima,* etc., which form an under storey to the main canopy and greatly enhance the degree of shade cast on the forest floor. When this stage is well advanced invasion by fire is very rare.

57. (*d*) *Concessions.*—Extensive collection of dry and green manure leaves from the reserves by ryots results in the annual depletion of organic constituents of the soil, so necessary for the production of good quality forest. Large areas of scrub seen in the neighbourhood of Baindur are partly attributable to the exercise and abuse of the special concessions.

Vegetational types.

58. The more easily recognizable vegetational types, occurring in the district are described in the following paragraphs. It was found difficult during the course of stock-mapping to describe accurately the vegetational type, when of a plainly transitional character. Most of the timber areas of the division were stock-mapped to types by the territorial staff. Therein an attempt was made to combine a differentiation between the ecological types, and the degree of maturity of the crop, by judging the probable net outturn of saleable species of and over four feet in girth per acre. Differentiation between moist and dry deciduous types was rather overlooked. The indication of the degree of maturity of the crop in the stock maps has been of little value in the selection of mature areas for working during the period of this plan, as the girth limit adopted herein is six feet. However, the stock maps prepared by the district staff have been incorporated in the final maps with slight modifications where the originals were obviously erroneous.

59. The vegetational types dealt with in the following pages, although not in conformity with recognized scientific types, are considered adequate enough for the purposes of this plan. Some of the more commonly occurring species in each type are given roughly in the order of their distribution.

60. *Scrub type* occurs commonly on lateritic soils in the coastal reserves as well as on poor exposed areas in other inland localities vulnerable to fires, and open to excessive grazing or abuse of privileges. It is common on grassy hill tops. Changes in the factors of the locality and susceptibility to external dangers regulate minor variations of this type, from scattered bushy evergreen growth to stunted sparsely distributed deciduous species often with a moist ground flora. The main type can further be subdivided into dry scrub, moist scrub and grassy scrub.

61. (*a*) *Dry scrub* is essentially confined to plains reserves. The principal species are *Strychnos Nux vomica, Careya arborea, Phyllanthus emblica, Anacardium occidentale, Eugenia wynaadensis, Bridelia retusa, Mangifera indica. Santalam album* and *Acacia sundra* also occur in certain localities.

The ground flora consists of grass, *Randia dumetorum, Lantana aculeata, Alstonia veneata, Ixora coccinea.*

Depletion of the organic constituents of the soil by excessive collection of leaf manure precludes chances of improvement of the existing crop. Examples of this type occur in Nire, Vorwady, Savanthagudde, Kasankatte and Darlegudde reserves.

62. (*b*) *Moist scrub* occurs in the inland deciduous timber reserves adjoining cultivation or waste lands, degraded to their present condition by depletion and ill-usage in the past.

The principal species are *Terminalia tomentosa, Terminalia paniculata, Phyllanthus emblica, Careya arborea, Aporosa lindleyana.*

Undergrowth consists of grass, *Clerodendron infortunatum, Helicteres Isora, Glycosmis pentaphylla, Randia dumetorum, Holarrhena antidysenterica, Ixora coccinea.* Climbers are generally plentiful.

63. (*c*) *Grassy scrub.*—The more commonly occurring species in this type are *Buchanania latifolia, Phyllanthus emblica, Careya arborea, Garuga pinnata.*

64. *Fuel type* includes the majority of the forest reserves of the plains. They are superior to scrub, and contain stunted trees of deciduous species, some fit for conversion as small timber.

The principal species in this type are *Terminalia paniculata, Xylia xylocarpa, Aporosa lindleyana, Lagerstrœmia lanceolata, Albizzia odoratissima, Albizzia lebbek, Ixora parviflora, Schleichera trijuga, Buchanania latifolia, Hopea wightiana, Litsaea wightiana, Strychnos nux vomica. Acacia sundra* also occurs in most of the fuel reserves in Coondapoor Range. Under suitable conditions where the tree canopy is open and undergrowth sparse, sandal occurs in admixture, e.g., in Talaburane, Nujinane, Chittur and Mavinaguly reserves.

The ground flora consists of grass, Strobilanthes, *Ixora coccinea, Holarrhena antidysenterica, Clerodendron infortunatum* and *Helicteres isora* in dry localities, and *Glycosmis pentaphylla, Webera, Cinnamomum* species in moist localities.

Natural regeneration of *Hopea wightiana* near parent trees in moist situations is plentiful.

65. *Acacia sundra type.*—Areas in which *Acacia sundra* preponderates, but which are not possible of inclusion under any other vegetational type, are classified under this head to facilitate indication on the type maps. This type occurs on open lateritic hills devoid of humus. Certain areas especially in the coastal reserves of Coondapoor Range, support an open scanty vegetation of which *Acacia sundra* is the commonest and most characteristic species. *Litsæa wightiana, Buchanania latifolia* and *Garuga pinnata* are occasional associates with *Acacia sundra.* The undergrowth consists of grass or thorny xerophytic shrubs. This type is very susceptible to annual fires. Natural regeneration of *Acacia sundra* exists to a moderate extent.

66. *Sandal type.*—Although sandal is primarily an associate of scrub jungle, it is considered desirable to form a separate type to indicate sandal bearing areas on the stock maps. The principal associates of sandal are *Buchanania latifolia, Terminalia tomentosa, Terminalia paniculata, Phyllanthus emblica, Careya arborea, Aporosa lindleyana.*

The ground flora consists of grass, Lantana, *Glycosmis pentaphylla, Ixora coccinea,* or other sparse deciduous shrubs.

67. *Dry deciduous type.*—The bulk of the forest areas along the foot-hills as also certain of the plains portions, constitute this type. Most of it consists of secondary regrowth from ' kumri ' and is susceptible to annual fires. Bamboos, *Bambusa arundinacea,* and reeds occur in places in admixture with the tree crop but rarely pure. Bamboos flowered and died between 1917 and 1923. Mature clumps are extremely rare and the present crop consists mostly of regeneration. The distribution of bamboos in the reserves is not indicated in the divisional stock maps.

Terminalia paniculata and *Lagerstrœmia lanceolata* form a preponderating proportion of the tree crop, while *Xylia xylocarpa* and *Terminalia tomentosa* are sparingly distributed in patches. The distribution of the two latter species cannot compare in extent with that obtaining in South Mangalore Division. *Xylia xylocarpa* occurs chiefly in gregarious patches in fuel reserves on soils less favourable for the development of other timber species. Other species represented in the dry deciduous type are *Albizzia odoratissima, Adina cordifolia, Bombax malabaricum, Albizzia lebbek, Dalbergia latifolia, Schleichera trijuga, Odina wodier, Terminalia belerica.*

The ground flora consists of *Helicteres isora, Clerodendron infortunatum, Holarrhena antidysenterica, Leea sambucina, Allophyllus cobbe, Strobilanthes* (tall variety), *Glycosmis pentaphylla.* Short grass is generally found. Natural regeneration of *Xylia xylocarpa* is moderately represented ; regeneration of other principal species is scanty.

68. *Moist deciduous type.*—This type occurs mostly in cool, protected, low lying valleys on favourable aspects, in localities not subject to inordinate disturbances of the tree canopy in the past. Overwood invariably consists of a preponderance of deciduous species with an occasional admixture of semi-evergreen. A pronounced intermediate storey, consisting of evergreen species is invariably present, and the ground flora is characteristically evergreen.

The principal species forming the overwood are *Terminalia paniculata, Lagerstrœmia lanceolata, Vitex altissima, Lagerstrœmia flos-reginae, Stephegyne parvifolia, Mangifera indica, Myristica canarica, Diospyros* species, *Zanthoxylum rhetsa.*

The middle storey consists of *Aporosa lindleyana, Limonia acidissima, Cinnamomum zeylanicum, Olea dioica,* etc.

Undergrowth consists of *Webera, Leea sambucina, Clerodendron infortunatum, Ixora malabarica,* and other evergreen shrubs.

Climbers are generally plentiful due to the luxuriant growth conditions available. Canes are occasionally found. Regeneration of principal species is negligible.

69. *Semi-evergreen type.*—Although in close association with the moist deciduous type, the semi-evergreen differs from it in a more liberal admixture of evergreen species in the top canopy and a denser underwood. All transitional types from a moist deciduous to a pure evergreen are included in this type. Evergreen areas kumried in the past but which are now an impenetrable tangled mass of thorny climbers, canes, reeds and softwood evergreens, are also classed in this type. The major portion of this type occurs on the ghat slopes below the evergreen zone.

The principal species occurring in this type are *Terminalia paniculata, Diospyros* species, *Lagerstrœmia lanceolata, Holigarna arnottiana, Lophopetallum wightianum, Machilus macrantha, Cinnamomum* species, *Myristica* species, *Mangifera indica, Vitex altissima, Eugenia gardneri, Hopea parviflora, Artocarpus hirsuta.*

Middle storey consists of *Elaeocarpus serratus, Cinnamomum* species, *Mallotus phillippinensis, Diospyros assimilis, Ixora parviflora.*

Ground flo a consists of *Webera, Strobilanthes* (short variety), *Ixora malabarica,* and other evergreen shrubs.

Climbers are plentiful, most of them unidentified. Canes are numerous.

70. *Evergreen type.*—The distribution of hardwood evergreen is confined to higher elevations on the ghats. The majority of suitable areas in this type, especially those in Megany Valley, Madibare, Mettukkallugudde and Andar reserves, were kumried in the past and the present crop consists of secondary regrowth of softwood evergreens. A few portions still remain virgin forests. No attempt is made to arrange the species occurring in this type in the order of their distribution, as many of the evergreen species have not been identified in the field.

The principal species are *Dipterocarpus indicus, Diospyros* species, *Calophyllum tomentosum, Hopea parviflora, Artocarpus hirsuta, Hardwickia pinnata, Myristica* species, *Acrocarpus fraxinifolius, Hemicyclia elata, Canarium strictum, Vateria indica, Pœciloneuron indicum, Cedrela toona, Bischofia javanica, Garcinia* species, *Cinnamomum* species, *Elaeocarpus* species, etc.

Middle storey and undergrowth consist of *Aporosa lindleyana, Ixora coccinea, Baccaurea courtallensis, Cinnamomum* species, reads, palms, ferns, etc.

71. *Swamp evergreen* is confined to low lying poorly drained localities. The principal species are *Myristica* species, *Lophopetalum wightianum, Holigarna Arnottiana,* the screw pine, canes, etc.

72. *Riverain evergreen* forms a distinct type occurring along river margins with a characteristic flora. The principal species are *Vateria indica, Hopea parviflora, Holigarna arnottiana, Eugenia* species, *Mimusops elengi, Calophyllum inophyllum, Elaeocarpus serratus Alstonia scholaris,* etc.

73. *Ghat Hopea.*—Between elevations 700 and 1,500 feet on the ghats *Hopea parviflora* tends to grow gregariously as in Andar reserve. Its chief associates are *Calophyllum elatum* and *Eugenia gardneri. Hopea parviflora* on the ghats is tall, straight and moderately sound. Conditions prevailing on the ghats appear optimum for the development of this species.

74. *Plains Hopea.*—In the plains, *Hopea parviflora* prefers moist situations and fairly deep soil adjoining cultivation but it also grows on bare laterite soil. Pure *Hopea parviflora* patches, locally known as 'hadies' (of which Pilarkan reserve is one), are distributed extensively in the plains portions, many of them privately owned and some being unreserves. *Hopea parviflora,* being the most valuable timber species in the district, is most conserved by people in their private holdings and 'kumakis.' Removal of unclassified species from the top canopy for use as fuel, and the annual clearance of inferior ground flora for purposes of leaf manure, afford a suitable seed bed with favourable light conditions for the reception of *Hopea parviflora* seeds in a good seed year. Continuous removal of undergrowth and the middle storey supplemented by occasional removal of trees from the top canopy in the succeeding years, accelerate the development of *Hopea parviflora* regeneration. Finally an almost pure wood of *Hopea parviflora* is obtained by the gradual elimination of inferior species.

75. Pilarkan reserve (300 acres) is very nearly a pure *Hopea parviflora* forest, the conditions under which it has grown being similar to those prevailing in private 'hadies.' It would appear that in 1877 in a letter to the Conservator from the Collector the latter referred to the existence of a thick undergrowth of *Hopea parviflora,* and in the same year the entire area appears to have been more or less cleared of timber growth. Organized repeated improvement fellings were done in the reserve to favour *Hopea parviflora* by the elimination of inferior species, and the present crop consists almost of pure *Hopea parviflora* 3 to 5 feet in girth at breast-height with some spontaneous growth of *Artocarpus hirsuta* in blanks.

General condition of the forest.

76. Although the prevailing quality of South Kanara forests does not compare very favourably with the teak forests of Malabar or South Coimbatore, yet their potentialities are immense, and at no distant date they will rank with the most valuable timber forests of the Presidency. The increasing demand for *Hopea parviflora* sleepers, and the greater use of this species in building construction, combined with the ease with which it can be introduced artificially, over fairly extensive suitable areas at no great expense, point to a much wider development of these forests in the near future. Their present degraded condition may be attributed to the following factors :—

(1) Rehabilitation of forest areas, is only partial since the abolition of 'kumri' in 1860, and forest settlement at the latter end of the last century. The forests are still prevailingly immature.

(2) Grave vulnerability of South Kanara reserves to fires, and difficulty of protection owing to the exercise of peculiar privileges adjoining reserves, and to the great length of the very irregular boundaries.

(3) Past neglect to restock felled areas with timber species. Gaps created by the removal of trees were allowed to be restocked with whatever seed might by chance happen to blow on to them. The rapid spread of undesirable species such as Strobilanthes, Lantana, young bamboos and other shrubs greatly minimize the chances of obtaining natural regeneration.

(4) Climber cutting operations have been practically ignored in the past. The growth of woody climbers, especially in moist situations, is very vigorous, with consequent detriment to tree-growth.

77. The deciduous forests of the district contain a fair stock of some of the more valuable timber species which can be marketed at a small profit now. The density of the stock is generally fair except in fire vulnerable localities where it is poor.' Canopy is fairly close, and in moist situations nearly complete. Mature trees of valuable species are sparsely distributed; not more than two to three trees per acre may be found exploitable at present. General unsoundness in trees is not very pronounced; natural unsoundness due to age is inconsiderable. In good situations trees reach an average height of 55 to 60 feet. Natural regeneration of the principal timber species is generally scanty and unsatisfactory. In areas felled in the past e.g., in Doddinamane, Madibare and Koratikalbare reserves, undesirable shrubs, particularly tend to inhibit reproduction of all other species.

78. The semi-evergreen and evergreen forests of the division support species, most of which, except *Hopea parviflora* and *Artocarpus hirsuta*, are of doubtful economic value at present. Some of the semi-evergreens of Someshwar and Andar reserves contain a very desirable admixture of *Hopea parviflora* and *Artocarpus hirsuta* which can be extracted at a profit. The more accessible portions of Someshwar reserve have been felled and regenerated.

General constitution of the age classes.

79. The evergreen forests approach a true selection type. All age gradations are satisfactorily represented.

80. A preponderance of middle girth classes from 3 to 5 feet, tending to group themselves in more of less even aged patches, is a noticeable feature of the deciduous forests. The following table shows the distribution of girth classes in the areas enumerated during the preparation of this plan. Enumerations were not made in the true evergreen type; the areas enumerated are in mature deciduous forests. Statistics are not available to determine the relation between girth and age classes.

Area enumerated—199·45 *acres.*

Species enumerated.	Number of trees in girth classes.							
	3′—4′	4′—5′	5′—6′	6′—7′	7′—8′	8′—9′	Over 9′	Total.
Terminalia paniculata	216	228	135	77	44	12	6	718
Terminalia tomentosa	13	6	4	..	..	..	..	23
Lagerstrœmia lanceolata	243	279	180	93	30	16	2	843
Lagerstrœmia flosreginae	2	4	3	..	1	..	..	10
Dalbergia latifolia	21	8	5	2	..	..	..	36
Adina cordifolia	5	3	1	5	3	2	..	19
Grewia tiliæfolia	11	11	..	..	..	..	..	22
Vitex altissima	8	15	5	8	2	1	..	39
Hopea parviflora	1	..	..	..	..	..	..	1
Albizzia lebbek	..	..	..	1	..	1	..	2
Albizzia odoratissima	2	2	..	..	..	1	..	5
Machilus macrantha	..	1	1	1	1	..	..	4
Litsea wightiana	10	2	..	..	..	..	..	12
Calophyllum tomentosum	11	3	2	1	..	..	..	17
Bridelia retusa	2	..	..	..	..	..	..	2
Artocarpus lakoocha	1	5	2	1	..	..	..	9
Eugenia gardneri	3	..	2	..	..	..	..	5
Eugenia jambolana	4	..	..	..	..	..	..	4
Eugenia operculata	..	..	1	..	1	2	..	4
Xylia xylocarpa	62	12	4	..	..	..	..	78
Total ..	**615**	**579**	**345**	**189**	**82**	**35**	**8**	**1,853**

SECTION 2.—INJURIES TO WHICH THE CROP IS LIABLE.

81. *Man.*—The abuse of special concessions in South Kanara, especially in the coastal reserves, has resulted in serious damage to the classified species and deterioration of forest soil.

Unlicensed extraction of large quantities of timber, either for purposes of trade or for domestic requirements prior to reservation, account for the present depleted stock of saleable timber in the reserves. While conserving the tree growth on their 'kumakis,' villagers avail themselves of every opportunity of stealthily removing timber or other forest produce from the adjoining reserves.

Inadequate regulations to govern the transit of sandalwood in the past, and the widespread practice of bringing sandalwood from Mysore and Coorg for purposes of distillation in South Kanara near Karkala, have facilited the illicit removal of this valuable species from Government lands.

Man is sometimes responsible for setting fire to the reserved forests on the hills overlooking his cultivation with the object of obtaining fresh pasture for his cattle, or to facilitate collection of minor forest products, or to scare away wild animals that damage the cultivation.

Large scale timber thefts are rare in the division, but considerable illicit removal of fuel, and abuse of concessions continue.

82. A statement of forest offences is given below :—

Year.	Number of offences under					Total.
	Grazing.	Fuel.	Manure leaf.	Timber.	Miscellaneous.	
1915–16	84	142	201	47	47	521
1916–17	131	139	215	24	70	579
1917–18	119	116	132	..	30	397
1918–19	76	150	131	..	82	439
1919–20	21	150	131	76	22	400
1920–21	74	54	132	13	30	303
1921–22	29	51	115	11	27	233
1922–23	11	38	108	18	34	209
1923–24	13	32	134	24	12	215
1924–25	8	47	42	14	12	123
1925–26	11	40	35	12	26	124
1926–27	14	24	19	15	22	94
1927–28	19	31	21	24	8	103
1928–29	22	31	20	17	16	106

There has been a gradual reduction in the total number of offences from 1922 due to the grant of special concessions for collection of leaf manure and dead fuel.

83. *Animals.*—Damage to forest growth by this agency is negligible. Bison destroy seedlings by trampling on them, and damage saplings by breaking them with their horns. Sambur and dear often nibble the leading shoots of seedlings, and are also responsible for pealing off the bark and cambium layer of saplings. Cattle greedily eat the tender leaves of *Acacia sundra* and sandal, while vermin readily attack the seeds of the above species when freshly sown. Elephants sometimes damage the trees by breaking or by pealing off bark.

84. *Insects.*—Damage to the leading shoot of *Hopea parviflora* in its infancy is caused externally by a locust, and internally by an insect which tunnels into the succulent stem, just below the current year's growth, eventually ringing it. The leading shoot breaks at the point of damage and often double leaders are produced.

Hopea parviflora saplings and poles sometimes die due to the attack of an insect identified as *Massicus venistus Pase,* the larvæ of which bore into living stems making numerous galleries, at first in the sapwood, and, when the larvæ are developed, into the heartwood.

Larvæ of another insect bore into *Hopea parviflora* saplings about a foot from the ground and tunnel in a downward direction to the roots, sometimes killing the sapling.

85. *Weeds and climbers.*—There are two species of Strobilanthes occurring in the division ; one is characteristic of the dry deciduous forests wherein the weed often reaches a height of 18 feet, and occurs in pure extensive patches to the entire elimination of timber species ; the other variety occurs in the evergreen type and rarely reaches more than six feet in height and is not an actual deterrent to the growth of evergreen species. Measures to combat the invasions of Strobilanthes are being tried on an experimental scale in Doddinamane reserve.

Lantana occurs only sparingly in the division. It is making inroads into some of the plains reserves, such as Todar and Hosabettu, but, the menace is not serious enough to warrant attempts at eradication. In fuel coupes fast-growing weeds and shrubs gain an early footing to the detriment of coppice and natural regrowth.

Climbers are abundant in all types of timber forest but kumried areas are especially infested with them. Climbers restrict the crowns of trees and damage the quality of timber by constricting their trunks. Scandent creepers are a nuisance in fuel coupes and plantations. They need to be pulled out frequently to keep the plants free.

86. *Floods.*—Rivers often overflow their banks during the monsoon, sometimes carrying away such tree growth as may happen to be in the course of the current. Owing to rapid surface drainage in South Kanara damage by this agency is small.

87. *Erosion.*—Seedlings just after germination and seeds freshly sown in clear-felled areas are liable to wash by surface water during the monsoon. Forest-clad areas are seldom susceptible to erosion owing to the protection afforded to the ground by tree-growth, and undergrowth.

88. *Wind.*—Damage by this agency is inappreciable. Occasionally trees are uprooted or broken during fierce local gales in the months of April and May. An indirect loss caused by wind is by stripping *Hopea parviflora* seed bearers of flowers and immature fruits in May.

89. *Fire.*—Considerable damage to forest growth is caused by annual fires. Trees become unsound and timber deteriorates in quality. Natural regeneration is burnt out. Humus and undecomposed vegetable mould get consumed by the fire, leaving the soil impoverished of its organic constituents so necessary for the production of good tree-growth. The quality of the forest itself deteriorates in course of time. Instances are not lacking where owing to incessant annual fires good deciduous forests have been converted into scrub. Loss of increment to forest growth by annual fires is not inconsiderable.

90. A classified abstract of fire occurrences is given below :—

Year.	District or division.	A Fires caused by accident or by carelessness in burning fire lines.		B Fires entering the forests by crossing exterior lines.		C. Fires beginning inside the reserve or fire-traced area. Carelessness or accident. Forest Coolies.		Travellers passing through reserved forest.		Lighting.	
		Number. (1)	Area in acres. (2)	Number. (3)	Area in acres. (4)	Number. (5)	Area in acres. (6)	Number. (7)	Area in acres. (8)	Number. (9)	Area in acres. (10)
1920 ..		5	142	12	57	..	..	26	406	2	10
1921 ..		4	280	19	136	1	15	13	197	..	..
1922 ..	South	..	..	2	4	..	..	5	46	..	..
1923 ..	Kanara	1	1	..	..	..	..	14	88	..	..
1924 ..	District—	3	1	3	71	..	..	6	108	..	..
1925 ..	North	1	1	2	7	1	2	5	17	..	..
1926 ..	Mangalore	..	..	14	360	2	32	6	55	..	..
1927 ..	Forest	..	..	10	298	..	..	6	46	..	..
1928 ..	Division.	..	..	14	326	2	187	8	65	..	..
1929 ..		..	..	..	..	..	..	..	..	..	..
1930 ..		..	..	8	102	2	123	29	970	..	..

Year.	District or division.	Incendiarism. To obtain pasture.		To scare away wild animals.		Malicious intent.		Total of C.		D Unknown causes.		Grand total of A, B, C and D.	
		Number. (11)	Area in acres. (12)	Number. (13)	Area in acres. (14)	Number. (15)	Area in acres (16)	Number. (17)	Area in acres. (18)	Number. (19)	Area in acres. (20)	Number. (21)	Area in acres. (22)
1920 ..		5	32	..	..	3	18	36	466	19	575	72	1,240
1921 ..		..	..	18	593	..	..	32	805	4	9	59	1,230
1922 ..	South	..	..	6	170	..	..	11	216	..	..	13	220
1923 ..	Kanara	..	..	1	60	..	..	15	148	8	473	24	622
1924 ..	District—	..	..	1	25	3	66	10	199	2	25	18	296
1925 ..	North	..	..	..	..	..	..	6	19	8	72	17	99
1926 ..	Mangalore	2	95	..	..	..	..	11	184	24	1,415	49	1,959
1927 ..	Forest	..	..	..	..	..	.	6	46	16	822	32	1,166
1928 ..	Division.	..	..	..	..	..	.	10	252	6	187	30	765
1929 ..		..	..	..	..	..	..	..	..	..	..	..	..
1930 ..		6	1,278	1	20	1	20	39	2,411	11	539	58	3,052

CHAPTER III.—UTILIZATION OF THE PRODUCE.

SECTION 1.—AGRICULTURAL CUSTOMS AND WANTS OF THE POPULATION.

91. South Kanara is essentially an agricultural district, more than three quarters of the working classes making their livelihood by cultivation. Cultivation consists of dry and wet ; the latter is carried on mainly in the valleys along watercourses which are usually fertile and are eminently suited for rice crops. The staple produce of South Kanara is rice. Next in the order of importance is coconut which is grown in extensive topes both along the coast and inland. Arecanut is grown more inland in protected moist valleys. Pepper and cardamom cultivation are carried on only to a very small extent ; these two are quasi-forest products, a certain amount being spontaneous growth while the balance is raised in arecanut topes. Sugarcane is grown on moist alluvial soils. Ragi and gram are the chief products of dry 'kumri' cultivation.

92. Cultivation is done with the aid of bullocks and buffaloes. Cattle do not thrive in South Kanara evidently due to the extraordinary humid atmospheric conditions ; the bulk of the cattle are imported from Mysore and North Kanara above the ghats. A big cattle fair is held in Subramanya at the foot of the Bisale ghats every year in December, when 50,000 heads of cattle or more are bought at very cheap rates.

93. From the forests people require chiefly material for agricultural implements, manure leaves and grazing facilities. In addition to ' kumaki ' rights considerable upland tracts of semi-forested waste lands are located in the interior, which serve the agricultural wants of the population to a degree rarely found elsewhere. On the other band in the coastal region demand for manure leaf is so heavy that the forest reserves are continuously denuded of their lower vegetational covering and dry humus.

94. The demand for agricultural implements from the reserves is not very great. The following species are however used for the purpose :—

Ploughs	*Strychnos nux vomica, Careya arborea, Hopea parviflora, Mimusops elengi, Lagerstrœmia lanceolata, Terminalia paniculata.*
Yokes	*Adina cordifolia, Stephegyne parvifolia, Artocarpus integrifolia, Calophyllum inophyllum, Terminalia paniculata.*
Levelling instrument	*Lophopetallum wightianum, Lagerstrœmia lanceolata.*
' Haligai '	*Mangifera indica.*
Axe-handles	*Xylia xylocarpa* poles.

95. The manure commonly used for agriculture in the district consists of a compost of rotten leaves and dung. The ryots do not grow their own green manure crops for purposes of replenishing their fields with constitutents lost in raising the paddy crop. Leaves and twigs are collected in the rainy season from unreserves as well as from reserves, and strewn on the floor of the shed where cattle are penned at night. The leaves and twigs are allowed to remain there rotting with the cattle dung, until the whole is reduced to a pulpy mass, after which it is removed and used as manure. In the hot weather the agricultural population collect a great quantity of dry leaves from the forest lands to manure their fields direct. In spite of the extensive areas of waste lands in the district, the people avail themselves to a great extent of dry and green leaf manure concessions from reserved forests where such have been granted, and conserve the resources in their own ' kumakis ' for emergencies.

96. Grazing is ample all over South Kanara. In addition to the extensive unreserves where grazing can be had free, it is allowed in reserved forests on payment of a nominal annual fee.

97. Further requirements of the population are :—

(1) *Building materials.*—Ryots usually obtain their requirements of timber by fellings trees in their ' kumakis ' after taking out the necessary permits.

(2) *Bamboos.*—These are collected from the reserves on payment of the usual seigniorage. Since bamboos flowered and died (in 1923) there is little left in the forests to meet the demand.

(3) *Canes.*—There is a growing industry in Baindur and Kolluru in the manufacture of rattan boxes which are used largely by the local population. The right to collect canes from the reserves is annually leased out.

(4) *Carts.*—The number of carts in South Kanara is few, considering the size of the district, as much of the transport is by boats.

(5) *Boats.*—Necessary timber for boat-making is generally obtained from the reserves on payment of the usual seigniorage.

(6) *Thatch grass.*—This is an absolute necessity for the majority of the houses of the working classes. The collection is made from unreserved grass lands of the division, which are considerable.

(7) *Fuel.*—The local population generally collect their requirements of fuel from unreserves and ' kumakis.' The concession of collecting dead fuel up to three inches in diameter is allowed in all the reserves except Pillarkan, Herur and Sablady. A certain number of poor people make a living by collecting dead fuel from the reserved forests under this concession and selling them in the adjacent towns in headloads.

SECTION 2.—MARKETS AND MARKETABLE PRODUCTS.

98. The principal markets for the absorption of the products obtained from the forests dealt with under this plan are Mangalore, Coondapoor, Hangarkatta and Bombay. Until 1929 the Kanara Rice and Saw Mills, Limited, at Coondapoor consumed the timber

obtained from Coondapoor and Shankaranarayana Forest Ranges but the company has since gone into liquidation. A small quantity of timber is exported to Goa and Bombay. Wooden sleepers are supplied to the railways. The market for 'cutch' has until now been in Hassan in Mysore State but attempts are now being made by the District Forest Officer to secure a foreign market as the demand for this product in Hassan has been very limited during the past two years. Large consignments of first class fuel are shipped to Bombay. Merchants from Bombay usually purchase our output of sandalwood.

99. The marketable products are timber in the form of sleepers and round logs, fuel, cutch, sandalwood and minor forest produce. Timber is usually sold in Coondapoor, Hangarkatta or Mangalore, but in 1926–27 a part of the Coondapoor Range timber was sent to Mangalore depot by sea and sold there at very satisfactory rates. Until recently most of the sales of Coondapoor and Shankaranarayana timber have been conducted by private treaty with the Kanara Saw Mills, Limited, but since their liquidation in 1929 much difficulty has been experienced in disposing of our stock. At present there is a stock of 18,000 cubic feet of timber in the round in Coondapoor depot, remaining unsold in spite of advertisement of the sales on more than one occasion. This is attributable largely to the present general economic depression. The timber from Udipi Range is transported to Hangarkatta, whence sleepers are despatched by sea to Mangalore.

100. Fuel is brought to Coondapoor depot, whence it is shipped either to Mangalore or to Bombay in country vessels, the better quality going to Bombay.

101. *Acacia sundra* trees are sold standing at so much per tree to a contractor who does the felling, transporting and manufacture of cutch in the vicinity of the forests. The manufactured product is transported by the contractor to Hassan by road where it is sold in the market to local dealers.

102. All sandalwood extracted in the division, after rough cleaning in the jungle, and final cleaning at the range headquarters, is brought down to Mangalore depot, where it is sold either in public auction or by private tender.

Classification of Produce.

103. Timber is classified into :—

First grade.—Mid-girth 60 inches and over and minimum length 10 feet.
Second grade.—Mid-girth 48 to 59 inches and minimum length 10 feet.
Third grade.—Minimum mid-girth of 31 inches.

Not graded—All saleable inferior species.

104. Sandalwood is classified into billets, roots, chips and dust ; but from this year detailed classification on the lines adopted in the 'Javadis' is being introduced.

105. Fuel is classified into Bombay and Mangalore qualities. Billets of *Xylia xylocarpa, Hopea wightiana, Terminalia tomentosa* and *Schleichera trijuga,* of and over 12 inches in girth are classified as suitable for the Bombay market, the rest being considered as Mangalore fuel.

SECTION 3.—LINES OF EXPORT.

106. The division is well served with a system of roads and a network of rivers and streams many of which are navigable to a distance of 12 to 15 miles from the coast owing to tidal influence. The rivers on their upper reaches are not suitable for transport purposes. The most important lines of export are :—

(1) The cart-road from Kolluru to Wandse and the Chakranadi from Wandse to Coondapoor or Gangolli port. This is a very important line of export in Coondapoor Range. Timber from Madibare, Megany Valley and Koraticalbare reserves is carted from the coupes to Wandse along the road over a distance of 12 to 15 miles and from there boated to Coondapoor along the Chakranadi. Fuel from Abbigudde, Chittur, Talaburane, Nujinane and Jennalane reserves is carted to Wandse, whence it is boated to Gangolli port.

(2) The forest road through Herur and Kursegudde reserves up to Kanal, on the bank of Kolluru river, and then along that river to Gangolli port forms another line of export for fuel from Herur and Kursegudde reserves.

(3) The Golihole-Baindur-Shirur road serves as a line of export for fuel from Guruvanacote, Hulimishipare, Baindur, Karnigudde, Kadike and Sarpanamane reserves to convenient ports like Baindur and Shirur.

(4) The Hosangadi-Sowda cart-road via Shankaranarayana and the river Haladi from Sowda to Coondapoor, forms the main line of export for the Shankaranarayana Range timber from Doddinamane and Mettukallugudde reserves. Fuel from Halakkihoa and Kamradihola reserves is transported to Guluvady by road and then boated down the Haladi river to Gangolli port.

(5) The Someshwar-Hebri-Kokkarani road and the river Sitanadi from Kokkarani to Hangarkatta is the chief line of export for timber from Someshwar reserve.

(6) Fuel from Kodyamale reserve is transported by road to Bantval whence it is boated to Mangalore down the Netravaty river.

Carting by road is almost impossible during the monsoon months from June to October.

SECTION 4.—METHODS OF EXPLOITATION AND THEIR COST.

Timber.

107. Felling and logging are done on contract at so much per cubic foot of timber converted. Dragging from stump site to cart-tracks is done by departmental elephants. Carting to river side depots and boating to sale depots are done on contract.

The following table shows the cost of extraction and transport of timber per cubic foot from various centres of timber operations in the district:—

Item number and nature of the operations.	Coondapoor range.	Udipi range.	Shankaranarayana range.
	RS. A. P.	RS. A. P.	RS. A. P.
1 Felling and logging	0 0 8	0 0 10	0 0 8
2 Dragging to cart-tracks by elephant power ..	0 2 3	0 2 3	0 2 3
3 Carting to riverside depot	0 3 4	0 3 9	0 2 10
	(To Wandse.)	(To Kokkarani.)	(To Sowda.)
4 Floating to coastal depot	0 0 6	0 0 9	0 0 11
	(To Coondapoor.)	(To Hangarkatta.)	(To Coondapoor.)
Cost of production per cubic foot	**0 6 9**	**0 7 7**	**0 6 8**

108. The rate for shipping logs from Coondapoor to Mangalore depot is Re. 0–3–6 per cubic foot.

109. For felling with the axe and logging by saws an extra two pies per cubic foot has to be paid. For felling and logging *Hopea parviflora* an extra two pies per cubic foot is required.

110. The cost of production and delivery of sleepers at Mangalore is given below :—

Item number and nature of operations.	Cost per B.G.	Cost per M.G.
	RS. A. P.	RS. A. P.
1 Felling and logging timber at 10 pies per cubic foot	0 4 7	0 2 3
2 Dragging logs by elephants to sawing depots and thence to roadside	0 12 5	0 6 1
3 Sawing	1 5 0	0 10 6
4 Construction of sheds, etc.	0 2 6	0 1 3
5 Construction and maintenance of roads and paths	0 3 6	0 1 9
6 Carting to Kokkarani and boating to Hangarkatta	0 14 1	0 6 9
7 Shipping to Mangalore	0 7 3	0 3 6
8 Cutting ends of sleepers	0 0 2	0 0 2
9 Binding	0 1 0	0 1 0
10 Miscellaneous	0 1 7	0 0 9
Total ..	**4 4 1**	**2 2 0**

The above rates are abstracted from past working in Udipi Range where sleeper operations are carried out annually on a large scale. In the other ranges there is very little sleeper wood ; for small quantities of *Xylia xylocarpa* that may be converted into sleepers in the other two ranges the above cost of production for Udipi Range may be adopted.

111. The rate for sawing scantlings is 7 annas per cubic foot of sawn material. Delivered at Mangalore it costs Re. 1–2–0 per cubic foot including cost of production, sawing and transport. Sawing reepers is paid at the rate of Rs. 11 per 1,000 running feet.

112. *Fuel* coupes are sold standing at so much per acre to contractors who do the felling and transport of the fuel. The figures of cost of production of fuel, delivered at Mangalore, as far as could be ascertained from contractors, are furnished below. The local

unit of measurement is one "Chowk" which equals 216 cubic feet of fuelwood billetted and stacked in a pile 6′ × 6′ × 6′. The average weight of a chowk is three tons. The following rates represent costs per "Chowk":—

Item number and nature of operation.	Cost varying From			To		
	RS.	A.	P.	RS.	A.	P.
1 Felling and stacking	3	0	0	3	8	0
2 Carting over three miles	3	8	0	4	8	0
3 Loading in boats	0	4	0	0	4	0
4 Boating to Gangolli port	0	8	0	0	8	0
5 Restacking and loading	0	8	0	0	8	0
6 Agent's commission	0	8	0	0	8	0
7 Machwa hire to Mangalore	4	0	0	4	8	0
8 Commission to selling agent at Mangalore	2	0	0	2	0	0
9 Port duties	0	4	0	0	4	0
10 Roads and paths	0	2	0	0	3	0
11 Seigniorage on fuel to the department	3	0	0	3	0	0
12 Supervision	0	8	0	0	8	0
Total ..	**18**	**2**	**0**	**20**	**3**	**0**

The cost of production of one chowk of fuel delivered at Mangalore thus varies from Rs. 18–2–0 to Rs. 20–3–0. It does not include contractor's profit.

The cost of shipping one chowk of fuel from Coondapoor or Baindur to Bombay varies from Rs. 16 to Rs. 17.

The above figures are applicable to the fuel series of Coondapoor Range as well as to the series in Shankaranarayana Range.

113. *Cutch.*—*Acacia sundra* trees are sold standing to a contractor who does the felling, transporting and manufacture of cutch.

The following figures based on the contractor's statement as to the cost of manufacturing cutch from a tree of 24 inches or over in girth, may be of use:—

Item number and operations.	Cost. RS.	A.	P.
1 Seigniorage per tree to the department	3	8	0
2 Felling and dressing	0	8	0
3 Transport to still	0	4	0
4 Chipping the heartwood	0	4	0
5 Boiling	0	8	0
6 Collection and transport of fuel	0	4	0
7 Kilns and their maintenance	0	4	0
8 Making into balls	0	4	0
9 Supervision charges	0	8	0
Total ..	**6**	**4**	**0**

The average outturn of manufactured cutch obtained from a tree of 24 inches in girth is about 20 lb. The cost of production of one pound of cutch ready for sale is 5 annas.

114. *Sandalwood.*—All operations connected with the extraction and cleaning of sandalwood are done departmentally. Uprooted trees are transported to forest depots where preliminary cleaning is done, whence they are despatched in bullock carts to the range headquarters, where the wood is finally cleaned and despatched to Mangalore.

115. *Minor forest produce.*—Collection from reserves and unreserves is annually leased out to contractors in the shape of small farms. The contractors do the collection and transport of the produce. Reliable data as to costs of production of the various minor products are not available for incorporation in this working plan.

SECTION 5.—PAST AND CURRENT PRICES.

Timber.

116. *Coondapoor depot.*—The following prices were obtained by the sale of timber of all species and grades from Doddinamane and Madibare reserves of Coondapoor and Shankaranarayana Ranges to the Kanara Saw Mills, Limited, delivered at Coondapoor:—

Year.	Quantity sold.	Price per cubic foot.	Year.	Quantity sold.	Price per cubic foot.
	C.FT.	RS. A. P.		C.FT.	RS. A. P.
1923 24 ..	34,211	0 11 0	1925–26 ..	25,236	0 8 0
1924–25 ..	20,090	0 12 0	1926–27 ..	9,361	0 9 0

In 1927–28, 2,984 c.ft. of *Terminalia paniculata* logs were sold at 8 annas per cubic foot and 126 c.ft. of *Albizzia lebbek* at 10 annas per cubic foot.

In 1928–29, 11,964 c.ft. of timber fetched the following rates :—

Species.	First grade.	Second grade.	Third grade.
	RS. A. P.	RS. A. P.	RS. A. P.
Lagerstrœmia lanceolata	0 10 6	0 9 6	0 8 6
Terminalia paniculata	0 8 6	0 8 6	0 8 6
Xylia xylocarpa	0 12 0	0 10 3	0 9 0
Litsæa wightiana	0 14 0	0 13 6	0 11 9
Dalbergia latifolia	1 8 0	1 4 0	1 0 0

The balance of the stock of 1927–28 timber, consisting of 1,778 c.ft. of *Xylia xylocarpa*, 595 c.ft. of *Lagerstrœmia lanceolata*, 233 c.ft. of *Calophyllum inophyllum*, 257 c.ft. of *Dalbergia latifolia*, 230 c.ft. of *Vitex altissima* and 91 c.ft. of 'Mashe' (*Litsœa wightiana*) was sold at an all round rate of Re. 0–8–6 per cubic foot.

In 1929–30 the following rates were obtained :—

1,068 c.ft. of *Vitex altissima* Re. 0–8–0 per cubic foot.

2,104 c.ft. of miscellaneous species, being the balance of the stock of 1928–29 from 4 to 5 annas per cubic foot.

68·16 c.ft. of *Xylia* scatlings Re. 0–13–0 per cubic foot.

In 1930–31, 7,464 c.ft. of timber of all species and grades were sold at Coondapoor depot at an average rate of Re. 0–9–9 per cubic foot and 101·2 c.ft. of *Xylia xylocarpa* scantlings were sold at Re. 0–12–6 per cubic foot.

117. *Udipi Range.*—In 1923–24 the following prices per cubic foot of timber were obtained :—

Species.	Price obtained. At Hangarkatta.	Price obtained. In the coupe.
	RS. A. P.	RS. A. P.
Hopea parviflora	1 1 0	0 8 6
Dalbergia latifolia	1 7 0	1 6 0
Artocarpus hirsuta	1 0 0	0 12 3
Lagerstrœmia lanceolata	0 13 0	0 9 0
Terminalia paniculata	0 11 0	..
Terminalia tomentosa	0 13 3	0 9 0
Xylia xylocarpa	0 12 6	0 9 0
Calophyllum wightianum	0 9 0	..
Vetix altissima	..	0 10 0
Litsæa wightiana	..	0 7 0

In 1924–25 the following rates were obtained in Hangarkatta depot :—

Hopea parviflora, Re. 0–8–0 per cubic foot.
Terminalia paniculata, Re. 0–8–0 per cubic foot.
Terminalia tomentosa, Re. 0–11–0 per cubic foot.
Miscellaneous, Re. 0–9–0 per cubic foot.

In the same year a private merchant bought the following timber from Someshwar, at the rates noted against each species :—

Species.	Particulars.	Rate per cubic foot.
		RS. A. P. RS. A. P.
Hopea parviflora ..	Scantlings less than 10′ long	2 6 0 to 2 8 0
	Planks above 14″ width	3 0 0
	Planks below 14″ width	2 6 0 to 2 8 0
	Reepers above 10′ length..	80 0 0 to 85 0 0 per 1,000 r.ft.
	Reepers below 10′ length	75 0 0 per 1,000 r.ft.
Xylia xylocarpa ..	Scantlings above 10′ long	2 4 0 per c.ft.
Terminalia tomentosa ..	Scantlings	2 6 0 to 2 8 0
Artocarpus hirsuta ..	Planks 18″ and above	2 12 0 to 3 0 0
Dalbergia latifolia ..	Scantlings	3 0 0 to 3 8 0
Vateria indica	Do.	1 0 0
Adina cordifolia	Planks 14″ and above in width	2 0 0
	Planks below 14″ in width	1 8 0
Albizzia lebbek	Scantlings	1 0 0
	Planks	1 4 0
Lagerstrœmia lanceolata	Planks	2 0 0 to 2 4
	Scantlings	1 14 0

In 1925–26 *Litsœa wightiana* logs were sold at Re. 0–11–0 per cubic foot and other timber at Re. 0–8–0 per cubic foot at Kokkarani.

In 1928–29 *Litsœa wightiana* logs were sold in the coupe itself at 7 annas per cubic foot. The prices realized at Hangarkatta depot for other timbers during 1928–29 are as follows :—

Species.	Price obtained per cubic foot of — First grade.	Second grade.	Third grade.
	RS. A. P.	RS. A. P.	RS. A. P.
Hopea parviflora	0 13 0	0 12 0	0 10 0
Terminalia tomentosa	0 14 0	0 13 6	0 11 9
Terminalia paniculata	0 8 6	0 8 6	0 8 6
Lagerstrœmia lanceolata	0 10 6	0 9 6	0 8 6
Vitex altissima	0 8 6	0 8 6	0 8 6
Albizzia lebbek	0 9 0	0 9 0	0 9 0
Pterocarpus marsupium	0 10 0	0 10 0	0 10 0
Artocarpus hirsuta	1 0 0	0 14 0	0 11 0

The following prices were obtained at Hangarkatta depot in 1929–30 timber sales :—

Vitex altissima and miscellaneous species—Logs at Re. 0–9–6 per cubic foot.

Terminalia tomentosa—III grade at Re. 0–9–3 per cubic foot.

Mashe logs (*Litsœa wightiana*) at Someshwar coupe, Re. 0–8–9 per cubic foot.

The following timber was transported to Bunder depot and sold there at the following rates :—

Terminalia tomentosa—I and II grades, Re. 1–4–0 to Rs. 1–8–0 per cubic foot.

Terminalia paniculata and *Lagerstrœmia lanceolata*, Re. 1 to Rs. 1–8–0 per cubic foot.

Hopea parviflora scantlings, Rs. 2–4–0 per cubic foot.

Hopea reepers, Rs. 66–0–0 per 1,000 koles.

In 1930–31 the following rates were obtained at Hangarkatta depot :—

16,704 c.ft. of logs of all species and grades at Re. 0–9–10 per cubic foot.

The following quantities of timber were transported to Mangalore and sold there at the following rates :—

3,564 c.ft. of all species, Re. 1–0–9 per cubic foot.

Hopea parviflora scantlings, Rs. 2–4–0 per cubic foot.

Rejected sleepers, Re. 0–8–0 per cubic foot.

Hopea parviflora reepers, Rs. 51 for 1,000 koles.

118. *Shankaranarayana Range.*—In 1926–27 all the timber from Doddinamane reserve was sold at Sowda depot at an average rate of 8 annas per cubic foot irrespective of species and grades.

In 1927–28 *Terminalia paniculata* logs were sold at 8 annas and *Lagerstrœmia lanceolata* third grade logs at 7 annas per cubic foot at Sowda depot.

In 1928–29 the following prices were obtained at Coondapoor for Doddinamane timber :—

Species.	Price obtained per cubic foot of — First grade.	Second grade.	Third grade.
	RS. A. P.	RS. A. P.	RS. A. P.
Lagerstrœmia lanceolata	0 10 6	0 9 6	0 8 6
Xylia xylocarpa	0 12 0	0 10 3	0 9 0
Terminalia paniculata	0 8 6	0 8 6	0 8 6
Litsæa wightiana	0 14 0	0 13 6	0 11 9
Dalbergia latifolia	1 8 0	1 4 0	1 0 0

In the same year some *Xylia xylocarpa* and *Litsœa wightiana* logs that remained unsold at Coondapoor were transported to Mangalore and sold there at 9 annas per cubic foot.

In 1929–30, 2,813 c.ft. of timber were transported to Coondapoor depot of which 793 c.ft. of *Terminalia paniculata* logs were sold at 10 annas per cubic foot and 318 c.ft. of *Lagerstrœmia lanceolata* were disposed of at 13 annas per cubic foot. The remaining stock of timber could not be sold due to lack of demand.

119. A striking feature in the sales of North Mangalore timber is the marked absence of competition among the purchasers. Hitherto the entire stock of Government timber at both Coondapoor and Hangarkatta depots was bought by the Kanara Rice and Saw Mills, Limited, of Coondapoor, which was largely helped by Government to the elimination of other less important timber merchants. In spite of the financial aid rendered to the above company by Government, primarily with a view to encourage private industry, it failed to prosper, presumably due to inefficient management of the company's finances. It went into liquidation in 1929. The department was able to dispose of timber fairly rapidly while the sawmill was in operation, but since it went into liquidation, considerable difficulty has been experienced in doing so. The present stock of timber in Coondapoor depot is 18,000 c.ft. While this is no doubt partly caused by general economic depression, it is probably also accentuated by the failure of the concern which had been assisted by Government. Other local competitors, who did not receive any special encouragement have now inadequate resources to undertake commitments in the timber trade.

Fuel.

120. Coupes are annually sold standing to a contractor, who does the simple coppice felling and transport of the produce. The following statement shows the areas of fuel coupes sold each year since 1922 and the prices obtained per acre :—

Year.	Name of reserve.	Coupe.	Area in acres.	Price per acre. RS.	A.	P.
1922	Hulimishipare	I	280	36	0	0
	Baindur	I	234	14	0	0
	Mavinaguli	I	100	42	0	0
	Kodiamale	IV	32	12	0	0
1923	Hulimishipare	II	363	29	0	0
	Baindur	II	230	23	8	0
	Mavinaguli	II	104	86	0	0
	Kodiamale	VI	22	40	8	0
1924	Hulimishipare	III	329	26	0	0
	Baindur	III	210	16	0	0
	Mavinaguli	III	100	47	0	0
	Kodiamale	VII	27	40	0	0
1925	Hulimishipare (revised coupe)	I	205	12	0	0
	Kadike	IV	238	26	0	0
	Abbigudde	I	178	55	0	0
	Mavinaguli	IV	126	36	0	0
1926	Kadike	V	218	13	4	0
	Abbigudde	II	226	43	0	0
	Kodiamale	VIII	35	10	0	0
	Do.	IX	24	13	0	0
	Suraladvi	V	104	14	0	0
1927	Kadike	VI	248	22	10	0
	Abbigudde	III	252	32	8	0
	Kodiamale	X	27	12	4	0
	Suraladvi	VI	115	21	0	0
1928	Kadike	VII	272	11	0	0
	Talabur Ane	IV	287	25	0	0
	Halakkihola	VII	95	35	0	0
1929	Talabur Ane	V	293	27	0	0
	Kodiamale	XI	27	12	0	0
	Do.	XII	31	42	0	0
	Halakkihola	VIII	..	27	0	0
1930	Karnigudde	XI	249	22	0	0
	Nujin Ane	VI	206	20	8	0
	Kodiamale	XIII	35	20	0	0
	Halakkihola	IX	88	23	0	0
1931	New series under Mr. Habibulla's proposed scheme.	..	..	..		
	Karnigudde	I	59	50	0	0
	Guruvanacote	I	52	21	0	0
	Kursegudde	I	78	15	4	0
	Herur	I	48	12	12	0
	Abbigudde	I	45	57	0	0
	Chittur	I	80	55	0	0
	Halakkihola (Mr. Lazarado's Plan)	X	101	19	1	0

Cutch.

121. Until 1920 the manufacture of cutch was done departmentally and the produce was sold in public auction. The following prices were obtained :—

Year.	Rate per ton. RS. A. P.	Year.	Rate per ton. RS. A. P.
1897	715 0 0	1909	725 0 0
1898	836 0 0	1910	686 0 0
1899	752 0 0	1911	726 0 0
1900	685 0 0	1912	805 0 0
1901	641 0 0	1913	846 0 0
1902	702 0 0	1914	900 0 0
1903	720 0 0	1915	803 0 0
1904	801 0 0	1916	810 0 0
1905	700 0 0	1917	750 0 0
1906	716 0 0	1918	750 0 0
1907	761 0 0	1919	800 0 0
1908	901 0 0		

Departmental manufacture cost Rs. 60 per candy excluding cost of two forest guards engaged on supervision and the selling price was Rs. 190 a candy. Net profit was Rs. 130 a candy. About 40 candies were annually supplied.

From 1920 marked trees were sold standing and the following prices were obtained :—

Year.	Number of trees sold.	Price obtained per tree. RS. A. P.	Year.	Number of trees sold.	Price obtained per tree. RS. A. P.
1920-21	..	6 6 0	1926-27	287	5 2 0
1921-22	1,500	5 0 0		1,506	3 6 0
1922-23	1,477	4 0 0	1927-28	1,405	3 0 0
1923-24	1,051	4 8 0		1,301	3 7 0
1924-25	275	4 9 0	1928-29	2,631	3 0 0
1925-26	1,581	3 5 0	1929-30	1,616	3 0 0
	1,345	5 8 0	No sales in 1930-31.		

Minor forest produce.

122. The right to collect minor forest products from the reserves and unreserves of the district is sold annually in public auction. The revenue obtained by the lease of minor produce farms is appended below for reserves and unreserves separately for each range or taluk :—

Year.	Reserved forests in the range of: Mangalore. RS. A.	Udipi. RS. A.	Shankaranarayana. RS. A.	Coondapoor. RS. A.	Total. RS. A.	Unreserves in the taluk of: Mangalore. RS. A.	Udipi. RS. A.	Karkal. RS. A.	Coondapoor. RS. A.	Total. RS. A.	Grand total. RS. A.
1915-16 ..	61 12	1,017 4	122 4	226 8	1,427 12	..	..	..	714 0	714 0	2,141 12
1916-17 ..	175 0	857 12	386 0	504 0	1,922 12	770 14	183 6	438 3	1,345 0	2,737 7	4,660 3
1917-18 ..	233 12	791 0	191 4	306 0	1,522 0	287 0	235 15	342 12	670 8	1,536 3	3,058 3
1918-19 ..	141 8	662 0	136 8	500 8	1,440 8	154 8	179 5	256 4	400 8	990 9	2,431 1
1919-20 ..	625 2	1,258 2	528 0	894 0	3,305 4	209 2	169 6	1,504 12	1,422 0	3,305 4	6,610 8
1920-21 ..	3 4	5 0	1,018 12	880 0	1,907 0	277 12	142 15	312 10	1,008 0	1,741 5	3,648 5
1921-22 ..	5 4	5 0	562 12	590 0	1,163 0	233 9	64 2	293 10	655 0	1,246 5	2,409 5
1922-23 ..	4 8	4 3	833 5	749 0	1,591 0	256 0	87 0	179 4	382 0	904 4	2,495 4
1923-24 ..	4 12	8 0	742 0	757 0	1,511 12	167 8	80 0	180 4	185 0	612 12	2,124 8
1924-25 ..	..	11 0	1,062 2	827 0	1,900 2	140 0	64 0	213 12	434 0	851 12	2,751 14
1925-26 ..	532 2	320 0	86 0	288 0	1,226 2	260 8	75 0	101 3	204 0	640 11	1,866 13
1926-27 ..	106 4	254 0	76 0	1,167 0	1,603 4	115 0	64 8	52 4	261 0	492 12	2,096 0
1927-28 ..	437 8	196 0	104 0	610 0	1,347 8	112 0	82 0	54 12	474 0	722 12	2,070 4
1928-29 ..	439 8	202 0	99 0	862 0	1,602 8	105 8	70 0	39 4	542 0	756 12	2,359 4
1929-30 ..	446	139 0	128 0	978 0	1,691 0	98 4	86 0	30 4	569 0	783 8	2,474 8
Total ..	**3,216 4**	**5,730 5**	**6,075 15**	**10,139 0**	**25,161 8**	**3,187 9**	**1,583 9**	**3,999 2**	**9,266 0**	**18,036 4**	**43,197 12**

Sandalwood.

123. The following statement shows the quantity sold and the price obtained for sandalwood in the past :—

Year.	Quantity sold. QR. LB. T.	Revenue obtained. RS. A. P.	Rate obtained per quarter of 28 lb.: Billets. RS. A. P.	Stumps and roots. RS. A. P.	Chips. RS. A. P.	Dust. RS. A. P.
1916 ..	..	389 12 0	11 4 0	..	0 8 0	..
1917 ..	..	401 13 5	20 0 0	..	..	..
1918 ..	..	756 5 0	..	..	..	..
1919 ..	..	8,743 12 7	23 8 0	22 0 0	..	..
1920 ..	187 18 20	1,107 9 7	20 0 0	20 0 0	5 0 0	..
1921 ..	82 6 10	1,941 0 6	25 8 0	27 8 0	9 0 0	..
1922 ..	357 17 0	5,606 1 10	17 8 0	17 8 0	3 2 0	..
1923 ..	1,090 23 10	14,508 4 2	16 3 0	14 9 0	4 1 0	..
1924 ..	197 26 20	2,840 2 0	16 5 2	18 1 0	6 9 2	7 0 0
1925 ..	1,702 8 0	22,886 4 3	17 0 0	17 0 0	6 0 0	7 0 0
1926 ..	1,529 18 28	21,954 7 2	17 0 0	16 0 0	6 13 0	10 0 0
1927 ..	905 10 30	14,044 13 9	18 7 10	18 7 10	7 3 5	13 0 0
1928 ..	361 18 25	5,987 13 1	19 9 5	19 9 5	8 13 5	15 0 0
1929 ..	118 3 20	1,772 3 8	21 9 9	21 9 9	10 0 2	15 0 0
1930 ..	139 19 0	2,373 14 7	18 12 2	18 12 2	8 8 2	12 8 0

CHAPTER IV.—STAFF AND LABOUR SUPPLY.

SECTION 1.—STAFF.

124. The present strength and distribution of the executive and clerical staff of this division is shown in the following statement :—

Designation.	Monthly pay. RS.	A.	P.
(a) Headquarters staff.			
District Forest Officer	547	9	0
Head clerk	80	0	0
Accountant	80	0	0
Second clerk	41	5	0
Third clerk	35	0	0
Fourth clerk	41	0	0
Draughtsman	35	0	0
Typist	35	0	0
Peons 2 on Rs. 14 each	28	0	0
Peons 2 on Rs. 13 each	26	0	0
Total	**948**	**14**	**0**
(b) Range staff.			
Coondapoor Range—			
Range Officer 1	200	0	0
Foresters 5	170	0	0
Forest guards 22	387	0	0
Range clerk 1	42	8	0
Range peon 1	14	0	0
Depot watcher at Coondapoor	11	0	0
Bungalow watcher	10	0	0
Total	**834**	**8**	**0**
Shankaranarayana Range—			
Range Officer 1	175	0	0
Foresters 3	135	0	0
Forest guards 9	159	0	0
Range clerk 1	41	0	0
Watchers 3	33	0	0
Range peon 1	12	0	0
Total	**555**	**0**	**0**
Udipi Range—			
Range Officer 1	100	0	0
Foresters 4	170	8	0
Forest guards 19	333	0	0
Range clerk 1	47	0	0
Range peon 1	14	0	0
Watchers 3	36	0	0
Total	**700**	**8**	**0**
Mangalore Range—			
Range Officer 1	240	0	0
Foresters 2	80	0	0
Forest guards 9	189	0	0
Range clerk 1	35	0	0
Range peon 1	12	0	0
Watcher 1	11	0	0
Total	**567**	**0**	**0**
Elephant establishment—			
Mahouts 3	66	0	0
Cavadies 3	45	0	0
Total	**111**	**0**	**0**

Total cost of the permanent and temporary establishment in the division per month is Rs. 3,716–14–0. Annual expenditure on establishment is therefore Rs. 44,602–8–0.

SECTION 2.—LABOUR.

125. Sufficient coolies are generally available to carry out the works of the Forest Department in the district. During the cultivation and harvest months some difficulty is experienced in procuring labour for regeneration and tending operations. Labour is

scarce in the Someshwar area and generally subordinates impress labour from outlying villages. Unskilled labour is paid at the rate of seven annas a day for a man and six annas for a woman or a boy, but from this year the rates are likely to be reduced to six and five annas respectively, owing to the general fall in the cost of living.

126. Felling coolies are always available in plenty. Kudubies usually undertake to fell trees at contract rates.

127. Sawyers are not available locally ; they are recruited from Malabar and their work is paid on contract.

CHAPTER V.—PAST SYSTEMS OF MANAGEMENT.

SECTION 1.—GENERAL HISTORY OF THE FOREST.

128. *Early political history.*—No record of the history of South Kanara is available prior to the eighth or ninth century A.D. At one time, it probably formed part of 'Kerala.' The country was known as 'Tuluva,' Tulu being still the principal spoken language of the district. The date of separation of 'Tuluva' from 'Kerala' is not definitely ascertainable but must have been prior to 700 A.D.

The Brahminical influence in 'Tuluva' dates from the incursion of Brahmans under the Kadamba King, Mayura Varma. Their influence for four or five centuries after they arrived was very great ; it is stated that the Brahmans were appointed Governors at Barkur, Mangalore, Kadaba and Kasaragod.

Several feudatory chiefs tried to secure control of 'Tuluva' which resulted in constant internecine wars till about 1336 A.D. when the Birasu Wodears (who had previously declared independence) were compelled to acknowledge the suzerainty of Vijayanagar. Under the administration of Vijayanagar, the country attained some measure of prosperity and a regular system of revenue was instituted. The Portuguese settled along the coast in the fifteenth century, and owing to the struggle between the Moors and the Portuguese for maritime trade supremacy, the sea board of South Kanara suffered considerably. By about 1526 A.D. all the coastal chiefs had to pay a subsidy to the Portuguese.

After the fall of Vijayanagar in 1565, 'Tuluva' suffered considerably by successive invasions by Muhammadans from above ghats. The prosperity of the country was at its lowest ebb, and the sufferings of the people had reached a climax, when Hyder Ali conquered Mysore in the eighteenth century. During the sixteenth and seventeenth centuries, the country was controlled by the Mysore dynasty at Bednore, during which time the Jain and Brahman chiefs recovered a good deal of their old influence. Hyder Ali took possession of Baindur and Mangalore, considering these two places of great importance as naval stations. Cultivated lands were severely taxed and an embargo was laid on the export of arecanuts and pepper which resulted in the rapid depopulation of the sub-ghat tracts.

In 1737, the British of the East India Company established a factory at Tellicherry and obtained a monopoly of all cardamom and pepper from certain areas. The latter half of the eighteenth century is largely a history of several wars between the English and the Mysore dynasty including the first and second Mysore wars, and the country was greatly impoverished. The last Mysore war broke out in 1799 and after the fall of Seringapatam, the stronghold of the Mysore dynasty, in that year, British supremacy was established in South Kanara and the subsequent history of the country is one of steady progress towards prosperity.

129. *Forestry features during early history.*—Very little record is available now to show what the forest policy under the early Indian Governments was. Value of the forests for the preservation of springs and the supply of manure leaves was recognized by private owners. Later, Tippu introduced severe rules for the conservation of sandalwood, for purposes of gaining revenue for the State, and teak for his navy.

130. As far back as the seventeenth century, cultivation, both shifting and permanent, was going on an extensive scale in the country, and the foot-hill portions were thickly populated. Preceding the advent of the British and during the regime of Hyder and Tippu, owing to the embargo laid on the cultivators of the foot-hills and the plains, which forbade the export of arecanuts and pepper to foreign markets, the country became much depopulated, and the areas at the foot of the ghats tended to become forests.

131. Under the British administration in the early part of the nineteenth century, the people were keen on extending their cultivation again, and forest growth was regarded as an enemy to be got rid of. The result was, large forest areas were cleared for purposes of cultivation. Forest and waste lands were looked upon by proprietors of landed estates

as private property intended for the benefit of the cultivators. In 1822 lists of all Government forest lands were called for with a view to establish what proprietary rights Government had over them. At the same time orders were issued to leave a margin of 100 yards of forest land between a private holding and a Government forest for the benefit of the landholder.

132. Between 1822 and 1860 there was practically no conservancy of the forests under Government control; in fact Government were very lenient in the matter of allowing the people the full benefit of the forest lands for their private use with the object of gradually establishing the proprietary rights of Government. The landholders, seizing advantage of the opportunity, encouraged coastal merchants to make extensive clearances in the forest, the produce of which was brought to the coast for sale. The resulting denudation accelerated the influx of Malabar timber to meet the local demand at Mangalore, at rates cheaper than those prevailing for Kanara timber.

133. At the same time the forests suffered to a very large extent by the commencement of 'kumri,' or shifting cultivation. The following account of kumri cultivation as practised at the time, published in the proceedings of the Board of Revenue in 1859 is very illuminating :—

"Kumri is the name given to cultivation which takes place on forest clearings. A hill-side is always selected, on the slopes of which a space is cleared at the end of the year. The wood is left to dry till the following March or April and then burned; in moist localities the seed is sown in the ashes on the fall of the first rain without the soil being touched by implement of any kind but, in the taluk of Bekal (Nileshwar magane) the land is ploughed. The only further operations are weeding and fencing. A small crop is taken off the ground in the second year and sometimes in the third, after which the spot is deserted until the jungle is sufficiently high to tempt the kumri cutter to renew the process."

134. Prior to the advent of the British in South Kanara the landed proprietors regarded themselves as the owners of all forest and waste lands, and so 'kumri' cultivators had to pay a regular rent every year to the Wargdar. Accordingly the practice was not exercised on any extensive scale.

135. Under the early British administration kumri was classified into 'Sirkar kumri' and 'Warg kumri,' according as the cultivators paid their assessment direct to the Government or to the Wargdar, who in his turn usually paid a small fee to the Sirkar. When the proprietary rights of Government over forest and waste lands were recognized and gradually began to be exercised, restrictions were laid on the landholders exacting assessment from the kumri cultivators. Eventually in 1860 the destructive effect on forest by the practice of this system was realized and orders were issued prohibiting 'Sirkar kumri' cultivation. At the same time discretion was allowed to the Collector to grant kumri cultivation to those of the people on whom the withdrawal was a real hardship. Assessment on 'warg' kumries was also remitted from that year. It was also recognized at the time that in consequence of the stoppage of the cultivation practised from time immemorial, the forest areas would be considerably depopulated of the hill tribes, and there would be no labour to carry on the collection of minor forest produce from the Government forest lands. A large number of Kudubi families in the Coondapoor taluk was entirely dependent on kumri cultivation for their livelihood. So the restriction was relaxed in the case of the Kudubies of Coondapoor. Consequently, while kumri cultivation was put an end to in the three ranges of Shankaranarayana, Udipi and Mangalore in 1860, the practice was allowed to be continued in Coondapoor Range.

136. The results of a rough survey of kumried areas made in 1922 are tabulated below :—

Range.	Reserve.	Areas of reserve in acres.	Approximate kumried area in acres.
Coondapoor	Hullumurudibare	5,472	2,580
	Koraticalbare	5,507	2,723
	Baindur	3,635	189
	Megany Valley	13,828	5,665
	Madibare	16,732	2,229
	Nagankalbare	4,892	1,338
Udipi	Someshwar	26,653	2,251
	Andar	19,460	2,376
	New Someshwar	2,477	150
Shankaranarayana	Baregundy	7,627	690
	Doddinamane	3,288	114
	Mettukallugudde	4,981	830
	Tombattu	17,996	1,623
	Ballimane	10,444	488
Mangalore	Naravi	28,443	3,855

It will be observed from the above statement that the reserves most extensively kumried are in Coondapoor Range.

137. Ragi and gram are the main crops raised on kumries; occasionally a certain amount of dhall, castor, gingelly, chillies and vegetables are also sown.

138. Suitable areas for kumri cultivation are the evergreen, semi-evergreen or moist deciduous types of forests and these have suffered most under this practice.

139. From about 1860 Government forest lands began to be brought under some sort of conservancy and the first officer placed in charge of the forests of Kanara was E. Thompson, who was appointed as an Overseer to begin with, and later designated as Sub-Assistant Conservator and eventually as Assistant Conservator. He was in charge from 1858 to the end of 1866. The history of the forest administration from that year is dealt with in section 2 of this chapter and so need not be repeated here.

140. In 1910, Coondapoor Range was divided into the present Coondapoor and Shankaranarayana Ranges.

141. Till 1916 all the forests of the division together with the forests of the present South Mangalore Division formed one unit known as the South Kanara Forest Division. In G.O. No. 3009, dated 13th October 1913, the division was bifurcated into Puttur and Coondapoor Forest Divisions, but the orders were held in abeyance in Board's Proceedings, Forest, Mis. No. 774, dated 14th December 1914. However, in G.O. No. 789, dated 6th April 1916, the bifurcation of the South Kanara Forest Division into the North Mangalore (the one dealt with under this plan) and the South Mangalore Forest Divisions was sanctioned and was given effect to in Board's Proceedings Forest No. 57, dated 11th April 1916.

142. A list of officers who held charge of the division from 1858 is given below :—

Number and name.	Designation.	Period.	Y.	M.
	SOUTH KANARA FOREST DIVISION.			
1 Mr. E. Thompson ..	Overseer, Sub-Assistant Conservator and then Assistant Conservator.	October 1858 to December 1866 ..	8	2
2 ,, G. Cadell	Deputy Conservator on probation and later Assistant Conservator.	December 1866 to November 1868; March 1869 to April 1869.	2	2
3 ,, H. F. Winter	Assistant Conservator ..	May 1869 to November 1870 ..	1	7
4 ,, J. W. Cherry	Do. ..	December 1870 to February 1872; October 1872 to June 1877; September 1877 to May 1878; May 1880 to June 1880.	7	10
5 ,, W. Carroll	Overseer and later Sub-Assistant Conservator.	May 1878 to May 1880; June 1880 to July 1883.	5	1
6 ,, H. Bradley, I.C.S. ..	Head Assistant Collector ..	September 1883 to April 1885 ..	1	10
7 ,, T. P. Peake	Assistant Conservator ..	April 1885 to July 1886; September 1886 to May 1889; August 1889 to May 1892.	6	10
8 ,, G. F. F. Foulkes ..	Do. ..	May 1892 to July 1894; November 1894 to September 1895.	3	2
9 ,, J. S. Battie	....	September 1895 to May 1898; August 1898 to May 1899.	3	9
10 ,, H. A. Latham ..	Deputy Conservator ..	September 1899 to February 1901; May 1901 to November 1902; May 1903 to April 1907.	7	0
11 ,, B. H. Barlow Poole ..	Do. ..	May 1907 to October 1908	1	6
12 ,, D. T. Barry	Do. ..	October 1908 to April 1911; May 1911 to February 1912; Ma y 1912 to February 1913.	4	0
13 ,, T. Clear	Assistant Conservator ..	February 1912 to May 1912 ..	0	3
14 ,, V. Raman Menon ..	Extra Assistant Conservator.	February 1913 to October 1914; February 1915 to February 1916.	2	9
15 ,, R. D. Richmond ..	Deputy Conservator ..	October 1914 to February 1915 ..	0	4
16 ,, J. H. Longrigg ..	Assistant Conservator ..	February 1915 to May 1916; January 1917 to November 1917; January 1918 to August 1918.	2	6
	NORTH MANGALORE FOREST DIVISION.			
17 Mr. J. Sadasiva Ayyar ..	Extra Assistant Conservator.	1st May 1916 to 14th April 1918 ..	2	0
18 ,, J. H. Longrigg ..	Deputy Conservator ..	15th April 1918 to 14th June 1918.	0	2
19 ,, J. Sadasiva Ayyar ..	Extra Assistant Conservator.	15th June 1918 to 1st June 1919 ..	1	0
20 ,, A. R. Narasimha Ayyangar.	Do.	2nd June 1919 to 7th July 1921 ..	2	1
21 ,, G. S. Lasrado ..	Do.	8th July 1921 to 15th June 1925 ..	3	11
22 ,, F. R. Madan	Deputy Conservator ..	16th June 1925 to 31st July 1925 ..	0	1
23 ,, V. G. Darrington ..	Do. ..	1st August 1925 to 22nd December 1925.	0	5
24 ,, G. S. Lasrado ..	Extra Assistant Conservator.	23rd December 1925 to 22nd October 1926.	0	10
25 ,, Muhammad Habibullah.	Do.	23rd October 1926 to 27th May 1930.	3	7
26 ,, K. T. Mathew ..	Deputy Conservator ..	28th May 1930 to date	..	

143. *Forest Panchayats.*—No account of the general history of Forest administration of the division would be complete, without a brief reference to the organization and working of village panchayats in the coastal reserves. A peculiar feature of South Kanara is the absence of villages in the sense in which the term is ordinarily recognized. Every area of cultivation in a valley has a hamlet attached to it where the ryot lives. It is rare to find more than a small group of houses together. There is accordingly, a strong disinclination on the part of the ryots to form panchayats ; while the subserving of communal interests by undertaking responsibilities of this nature fails altogether to arouse interest.

144. In 1922 the Chief Conservator of Forests ordered the District Forest Officer to inquire into the possibilities of forming, either village panchayats, under which 50 per cent of the grazing revenue would be refunded to the panchayat, or to introduce the forest village system, whereby each permit holder gets a proportionate refund of the grazing fees, provided the forests were protected against fire and theft.

145. In 1922–23 on the recommendation of the District Forest Officer the following nine village panchayats were constituted and necessary agreements were executed :—

Range.	Panchayat.
Mangalore	1 Todar and Hosabettu.
	2 Panamberi.
	3 Mujimalai.
Udipi	4 Mavinakodlu and Matkalgudde.
	5 Jarvattukadu and Jatkatmale.
Shankaranarayana	6 Tenkahola.
Coondapoor	7 Kursegudde.
	8 Sarpanamane, Savanthagudde and Kadike.
	9 Baindur and Karnigudde.

In the year of formation the panchayats were reported to have worked satisfactorily, and a proportionate refund of the grazing revenue was granted to them. Panamberi and Mujumalai panchayats were dissolved in 1923–24 on the report of the District Forest Officer that illicit fellings were going on in these two reserves with the connivance of the panchayatdars. In the same year the three panchayats of Coondapoor Range did not operate, as they failed to renew their agreements. In 1924–25 a new panchayat was constituted for Durgamalai reserve. Two of the Coondapoor panchayats renewed their agreements. Owing to numerous illicit fellings in Todar and Hosabettu panchayat no refund of grazing revenue was granted to it. In 1925–26 separate panchayats were formed for Todar and Hosabettu reserves. In 1926–27 owing to the abuse of concessions in Baindur and Shirur panchayat areas, no refund of grazing revenue was granted. In 1927–28 only three panchayats renewed their agreements, Todar, Hosabettu and Tenkahola, and these continue to operate at the present time.

146. Past working of panchayats in South Kanara has been disappointing. Abuse of concessions in panchayat areas, wholesale illicit fellings very often with the connivance of the panchayatdars, and the disinclination on the part of the panchayats to renew the annual agreements, all these considerations indicate the inadvisability of continuing panchayat management in future.

SECTION 2.—PAST SYSTEMS OF MANAGEMENT AND THEIR RESULTS.

147. In order to maintain a running history of past management, this section will be dealt with under the following heads :—

Timber,	Cutch,
Fuel,	Minor forest produce and
Bamboo,	Grazing.
Sandal,	

Timber.

148. In the days of ' jungle conservancy ' the ' permit system ' was in vogue in Coondapoor and Mangalore Ranges. In Udipi Range large contracts appear to have been given in the ghat tracts, but no records of these operations or transactions have been maintained, except a statement recorded in 1924 from retired Deputy Ranger DeSouza, which is quoted below :—

" In 1862 three overseers were appointed for the first time. Departmental fellings were started in Andar ghats in 1862 and round Hospet and Someshwar in 1864. Only Poon was felled in Andar ghats. The timber from around Hospet was carted to Baje and then floated to Kalianpur with the help of bamboos. Smaller

logs were taken by boats. The Someshwar fellings were a failure and stopped after two years. In 1865 timber fellings were also going on at Hallebagalu which is a couple of miles south of Hosangady. This timber was floated down the Hallebagalu river, via Halady to Coondapoor. Temporary bunds were erected to assist the floating of logs. Overseer Wilson was in charge of Coondapoor and Udipi taluks from 1862 to about 1867."

149. In 1886 the 'permit system' was introduced in Udipi Range also, but in 1893 it was replaced by departmental fellings on a modified Selection System. This proved a financial failure; so in 1900 trees were marked in the forests of Udipi Range by the Range Officer and were removed by purchasers after paying the stump fee.

150. In 1895 improvement fellings were carried out in Pillarkan and Someshwar reserves to favour *Hopea parviflora.*

151. The year 1902 marks the preparation of systematic working plans for Coondapoor, Udipi and Mangalore Ranges, by Mr. Foulkes which were sanctioned in Board's Proceedings Forests Nos. 251 and 252, dated 5th September 1902, and 257, dated 8th September 1902, respectively.

152. *Coondapoor Range.*—Under the provisions of Mr. Foulkes' Working Plan, a Timber Working Circle consisting of the non-kumried and accessible areas in the neighbourhood of Halakal, in Megany Valley, Madibare and Murkodihola reserves, was constituted. The extent of the working circle was 2,073 acres. The method of treatment prescribed was the selection system with a minimum diameter limit of two feet at breast height. It was prescribed that marking should be done by the Range Officer and extraction was by purchasers on permit. The felling cycle was fixed at forty years. Ten coupes were allotted and further coupes were to be apportioned at the time of revision. Enumerations along representative lines were done in all three reserves over an aggregate area of 60 acres.

153. In 1906 the District Forest Officer reported that the Megany Valley timber coupes 1 and 2 were inaccessible and contained extremely few mature or marketable trees, and that the local demand for timber could be met from the fuel coupes of Coondapoor Range prescribed under Mr. Foulkes' Plan. On this the Conservator ordered the closure of this Working Circle until the working plan was due for revision, as he held it to be vague and indefinite.

154. In 1908 the District Forest Officer proposed to reopen the Timber Working Circle, but suggested working in Madibare reserve instead of Megany Valley. Accordingly the Conservator sanctioned the working of the Madibare coupes in the order, 7, 8, 6 and 5, adopting the numbers in the original working plan. Coupes 7 and 8 were worked and felling was proceeding in coupe 6, when Mr. Raman Menon, the then District Forest Officer, proceeded to revise the plan, as the allotment of coupes and the rotation were considered by him faulty. The revised plan did not materialise but certain sketches were prepared. According to this scheme the unworked portion of coupe 6 (80 acres) was converted into coupe 1 and worked in 1914–16, yielding 6,251 cubic feet of timber and 11,000 bamboos. Coupe 2 of 110 acres was worked in 1915–16 and yielded 2,500 cubic feet of timber. Felling was subsequently stopped as the promised revised draft of the working plan was not forthcoming.

155. In 1920–21 fellings were made in Murkodihola reserve coupes 6 and 7; 648 trees were marked for felling and 10,678 cubic feet of timber were obtained.

156. From 1923–24 further fellings in Madibare reserve were conducted, no longer under working plan provisions but solely as revenue fellings for the production of 15,000 cubic feet of timber annually. Every year the District Forest Officer selected an area as close to the road as possible, and obtained the sanction of the Conservator for extraction of timber. The following statement shows the areas felled and the outturn obtained under this arrangement.

Year of felling.	Reserve.	Coupe number.	Area in acres.	Number of trees marked.	Number of trees felled.	Yield in c.ft.	Remarks.
1923–24	Madibare	1	580	..	1,320	34,211	
1924–25	Do.	2	500	..	907	20,000	
1925–26	Do.	3	358	802	802	25,235	Girth limit 5′ at breast height.
1926–27	Do.	4	266	803	635	13,345	
1927–28	Do.	5	181	701	655	15,261	
1928–29	Do.	5	12	46	42	947	
	Do.	6	285	506	416	14,273	
1929–30	Do.	6	44	..	63	1,678	Girth limit 4½′ at breast height.
	Koraticalbare	7	65	312	136	3,764	
1930–31	Do.	7	65	342	337	10,443	
1931–32	Do.	8	99	Under working.			

157. *Shankaranarayana Range.*—In 1911, on the recommendation of Mr. Barry, the District Forest Officer, a scheme for improvement felling and creeper cutting in Doddinamane reserve was sanctioned in Conservator's D. Dis. No. 1804/12. The object of the scheme was to improve the growing stock generally, with a view to include the reserve in the Timber Working Circle ten years later. The provisions of the scheme included the removal by girdling or felling of trees of inferior species, and cutting climbers and creepers over one coupe every year. For this purpose the reserve was divided into ten compartments. The prescriptions were carried out in the first three compartments of the reserve, but they were subsequently abandoned during the time of Mr. Raman Menon. The reasons for this procedure are not ascertainable from the records. Improvement fellings and climber cuttings done in compartments 1 to 3 have, undoubtedly, resulted in the improvement of the growing stock.

158. From 1924–25 regular timber fellings were commenced in Doddinamane reserve, not under any working plan but purely on a revenue producing basis. The following statement shows the coupes worked and the yield obtained under this arrangement :—

Year of felling.	Coupe number.	Area of coupe in acres.	Number of trees marked.	Number of trees felled.	Yield in c.ft.	Remarks.
1924–25 ..	1	84	..	..	2,793	Girth limit 5′ at breast height.
1925–26 ..	1	..	..	..	7,213	
1926–27 ..	2	120	..	..	10,171	
1927–28 ..	2	..	76	74	2,491	
	3	55	328	253	7,690	
1928–29 ..	3	13	74	71	1,837	Girth limit $4\frac{1}{2}'$ at breast height.
	4	96	387	274	8,169	
1929–30 ..	4	..	..	107	2,935	
1930–31 ..	5	48	376	367	10,795	
1931–32 ..	6	..	Under working.			

Results of past management of timber forests in Coondapoor and Shankaranarayana Ranges discussed and criticised.

159. Timber extraction in the past has been primarily on a revenue producing basis. No adequate steps were taken to ensure regeneration of the felled areas, with the consequence, that gaps created by the fellings were rapidly invaded and overgrown by dense tall Strobilanthes, which inhibited the growth of all other species.

160. The adoption of low girth limits is further open to criticism. Until 1928–29 the girth limit was fixed at 5 feet at breast-height irrespective of species, but since then it has been reduced to $4\frac{1}{2}$ feet. No attempt has been made to justify these particular dimensions, beyond the fact that they are the minimum market requirements, and in view of the paucity of regeneration and luxuriance of weed growth on the forest floor, the silvicultural advisability of this practice—unless accompanied by sustained and determined efforts to regenerate the coupes felled over—is open seriously to question. In our present state of knowledge the adoption of such a low minimum standard as $4\frac{1}{2}$ feet girth at breast height for all species is most detrimental to the interests of the crop.

161. With the exception of *Xylia xylocarpa* the rate of growth of deciduous species in South Kanara is sufficient to ensure that timber trees will remain in sound healthy condition up to at least $5\frac{1}{2}$ feet in girth, while the majority, given protection from fire, are observed to remain sound up to 6 or 7 feet in girth. The smaller girth limits have hitherto been adopted in order to obtain the required annual outturn from coupes of manageable size. The timber forests of the division remain still predominantly immature, and for that reason some compromise in the matter of exploitable sizes is probably justifiable on grounds of expediency. The practice hitherto followed of marking trees for felling according to an arbitrary and a very low girth figure, without restriction upon the degree of intensity of felling, and with no precautions to ensure fresh regeneration on the area, is obviously erroneous in principle, and has merely aggravated the spread of noxious shrubs and the permanent depletion of the crop. Moreover no provision has hitherto been made for uniformity of felling within the coupe, so that, provided the requisite yield was obtainable from the most convenient parts of the coupe, there was a tendency to over-extract from such portions while neglecting others.

162. On the whole the forests have suffered considerably by over-extraction and failure to restock the areas subsequently with useful species.

163. Spasmodic efforts have however been made in the more recent past to regenerate artificially disproportionately small areas in Madibare reserve. These have been inadequately supervised and recorded. Much of the work was carried out by the subordinate staff 'free of cost'; comment upon the value of such work is unnecessary, and there can be no continuity of policy.

164. In coupe 2 of Madibare reserve, an area of 7½ acres, close to the road, was sown with *Hopea parviflora* at intervals of 12 feet along lines 27 feet apart. The present stock is patchy and height growth is poor. Conditions of the ground flora, middle storey, light and soil do not appear conducive to the proper development of this species.

165. An area of 50 acres in Madibare reserve adjoining Jedkal was sown with *Hopea parviflora*. The results are very disappointing. Parts of it should have been rejected as unsuitable for *Hopea parviflora* owing to laterite outcrops. Inadequate shade and the absence of desirable undergrowth and middle storey are largely responsible for failure in many places. The present stock is very poor.

166. Although an area of 50 acres in Madibare felled coupes 1 and 2 was aligned and staked, only 8½ acres were eventually sown with *Xylia xylocarpa* in 1927–28. Survivals in May 1928 were only 30 per cent. Adjoining this area another plot of two acres was sown with *Xylia xylocarpa* at an espacement of 12 feet by 12 feet in 1928–29. The percentage of survivals in May 1929 was 89. When inspected in March 1931 the seedlings did not look healthy ; the density of stock was moderate and the seedlings were about 1 foot high.

167. *Udipi Range*.—Reference has already been made in the beginning of this section that timber extraction was carried on in the reserves of Someshwar and Andar prior to reservation. Large contracts appear to have been given for timber extraction in these tracts under the 'Jungle Conservancy' but no records of these transactions have been maintained. In the year 1893 the 'permit system' was changed into departmental working ; but this proved a financial failure and in 1900 trees were marked by the Range Officer and sold on permits.

168. A working plan was prepared by Mr. Foulkes in 1902 which was sanctioned in Board's Proceedings No. 252 under which a timber working circle consisting of the better stocked accessible parts of Someshwar reserve was constituted. The object of the working plan was to regulate fellings over defined annual coupes. The method of treatment prescribed was the 'selection system.' The yield was regulated by area with a check as to the number of trees to be extracted arrived at from the results of enumeration. Minimum diameter limit of species considered fit for extraction was fixed at two feet at breast height except in the case of *Xylia* where subsequently a girth limit of 5 feet was adopted. The felling cycle was fixed at forty years and ten coupes for working during the currency of the plan were prescribed in Someshwar reserve.

169. In accordance with the prescriptions of the above working plan, all the ten coupes were worked over once between the years 1903 to 1915. Initially marked trees were sold on stump fee system, but subsequently timber was extracted departmentally and sold in small convenient lots. No attempt was made during the period to restock the felled areas with regeneration of valuable species.

170. Considerable changes in the forest policy and scope in the administration of the division were effected during the period 1920 to 1930. The working plan by Mr. Foulkes became inoperative and timber feelings were again commenced in Halesomeshwar and Someshwar reserves no longer under working plan provisions but purely on a revenue producing basis for the supply of an agreed number of sleepers to the railway and logs to Hangarkatta depot. Timber extraction was based on a selection method with an arbitrary girth limit of 54 inches at breast height irrespective of species ; the silvicultural wisdom of such a procedure is open to criticism. *Hopea parviflora* and *Xylia xylocarpa* were converted into railway sleepers while timber of miscellaneous species in the log was sold at Hangarkatta depot. Annually about 22,000 cubic feet (net) of timber were extracted from the reserve of which about 50 per cent consisted of sleeper wood. The following table shows the coupes felled over, their area and the outturn obtained from 1920–21 :—

Year.	Reserve.	Coupe number.	Area in acres.	Yield obtained in c.ft.
1920–21	Halesomeshwar	I	..	7,925
1921–22	Do.	II	192	11,553
1922–23	Do.	III	212	15,433
1923–24	Do.	IV	560	20,220
1924–25	Do.	VII	232	13,700
		XIII	300	6,284
1925–26	Someshwar	I	162	22,124
1926–27	Do.	II	235	26,216
1927–28	Do.	III	286	25,515
		IV	120	11,206
1928–29	Do.	IV	242	15,378
		V	..	4,834
1929–30	Do.	V	299	10,499
		VI-*a*	52	18,405
1930–31	Do.	VI-*b*	..	12,907
1931–32	Do.	VII	..	Under felling.

171. Mr. Tireman, first as Conservator of Forests and then as Chief Conservator, initiated a systematic policy of regenerating extensive suitable areas outside the timber coupes with evergreen species of utilizable value. His efforts have undoubtedly achieved satisfactory results. His policy was :—

(1) to regenerate moist deciduous forests containing a desirable consistency and composition of evergreen ground flora with evergreen timber species principally *Hopea parviflora* ;

(2) to concentrate the available staff on intense artificial regeneration operations over vast areas ; and

(3) to realize subsequently trees of saleable species in the top canopy partly on considerations of revenue and partly on silvicultural grounds.

Accordingly a start was made in 1920–21 in Jatkatmale and Someshwar reserves, to convert the deciduous forests into evergreen. The total area so far converted is about 3,800 acres. A detailed statement showing the area annually regenerated and its cost of formation is given in paragraph 449. Detailed notes regarding the formation of the plantations, the costs of various operations and their present condition are found in the Control and Plantation Journals maintained by the District Forest Officer.

Fuel.

172. In order to present a comprehensive account of the past management of the fuel forests of the division, it is convenient to deal with each range separately. Separate working plans have moreover been sanctioned for each range of the division in the past.

173. *Udipi Range.—For a long time it was the practice to transport sandalwood* from Mysore territory and Coorg for distillation of its essential oil in Karkal taluk of Udipi Range. The reasons are obvious ; more cheap fuel was obtainable in South Kanara than in Mysore and facilities for transport to Bombay were greater by sea from Kanara coast than by land. It was a very large private industry and at one time as many as 1,000 stills were operating in Karkal taluk, each paying Government Rs. 10 per annum for the right of collecting their requirements of fuel from Government reserves. From 1881 the working of sandal stills was in the hands of a contractor, who paid a lump sum for the privilege of erecting a certain number of stills and cutting fuel for them from the reserves throughout the season. Subsequently the right was sold in public auction, but there was usually a combination amongst the contractors, and it eventually became the custom to accept the offer of one Hyder Sahib for Rs. 11,000 per year. The right of felling fuel was in practice sub-let and the felling was left in the hands of working coolies. The condition imposed by the Forest Department at the time was that trees of certain species should not be felled at all, nor saplings of other kinds below a certain size.

174. After an inspection of the forests in 1883, Mr. Walker reported that the fellings should be controlled and suggested they should be worked under the coppice with standards system.

175. In or about 1887 it was realized that the system of allowing still owners to cut what they liked out of the Government forests was not conducive to their improvement. Apart from indiscriminate hacking no trouble was taken by still owners to ensure coppice reproduction. Consequently Government reserves were closed in that year to still owners.

176. In 1889 a High Court ruling decided that sandalwood distillation would come under the category of 'domestic' use as opposed to 'trade' purposes, and that still owners could cut the necessary fuel for their stills from 'kumaki' lands. The decision was a welcome one to the still owners who then stole fuel from Government forests under the cloak of 'kumaki produce.' Illicit felling, on a very large scale, ensued and the forest staff could not cope adequately with the task of protection.

177. In 1893–94 an attempt was made to cut and supply departmentally fuel for the still owners from Government reserves at the rate of Rs. 1–4–0 per mensem per still. This was found too laborious an undertaking in comparison with the revenue realized, and supervision was extremely difficult.

178. In 1898–99 selected forest areas were leased out for six to nine months in the year for supplying fuel to a definite number of stills. Felling was done by still owners under departmental supervision. A fee of Re. 1 per still per mensem was realized.

179. In 1902 the fuel forests of Udipi Range were brought under systematic working in Mr. Foulkes' Working Plan sanctioned in Board's Proceedings No. 252, dated 5th September 1902. Six sandal oil fuel working circles were provided for in the plan, namely :—

Working circle.	Reserve.	Area in acres.
III	Manaje	400
IV	Chinkramalai	1,875
V	Durgamalai	777
VI	Andar north	425
VII	Andar south	817
VIII	Nire	650

The silvicultural system prescribed was ' coppice with standards ', reserving fifteen standards per acre, and the rotation was fixed at twenty-five years.

180. In 1905 Andar North and South Working Circles were combined into one ; but in 1906 they were reformed into two with alterations in the order of the coupes and of their area.

181. In 1910 Nire Working Circle was closed as there was no demand for installation of sandal stills in it and the area was also unsuited to fuel extraction.

182. Chinkramalai Working Circle was never opened and only one coupe was worked in Durgamalai.

183. In the other working circles the areas were divided into annual coupes and stills were allowed to be erected in them, the still owners cutting their fuel requirements from the coupe subject to silvicultural considerations, paying Government at the rate of Re. 1 per still per mensem, instead of by the quantity of fuel cut. In 1918 there were sixteen stills in Andar South.

184. Fuel working in Udipi Range was discontinued from 1920.

185. *Coondapoor Range.*—In the early period of forest administration collection of fuel was done under the ' permit system ' the object being to realize revenue which would otherwise be lost.

186. In 1895 departmental fuel operations were carried on in Sablady reserve. In the same year one contractor bought a fuel area in Chittur reserve for cutch boiling.

187. In 1897 the forests of Chittur and Sablady were worked on contract. A working plan to form a fuel series in Sarpanamane, Savanthagudde, Kadike, Karnigudde, Baindur and Guruvanacote reserves was approved. Felling was on contract, the contractor taking a fixed quantity of fuel at agreed prices.

188. A system had grown up of leasing out the right to charge import duties on fuel brought to the following stations :—

Coondapoor, Udipi, Karkal, Mangalore, Gangolli, Basrur, Mulki and Mudabidri.

The right of checking permits for firewood brought from ' kumakis ' and unreserves and levying fees on it, was auctioned annually. The contractors were authorized to act as tanahdars.

189. In 1902 Mr. Foulkes prepared a working plan for the range sanctioned in Board's Proceedings Forest No. 251, dated 5th September 1902. Eight fuel felling series were constituted :—

Felling series number.	Reserves.	Area in acres.
I	Sarpanamane, Karnigudde, Kadike	2,883
II	Guruvanacote	1,481
III	Chittur	1,781
IV	Talaburane, Kamradihola and Nujinane	1,982
V	Korakoppadahola	405
VI	Gunderberupare	1,936
VII	Bakudihola and Surtihola	1,184
VIII	Sablady	208

(Until 1902 the three reserves included in working circle No. I had been worked separately and simultaneously on a twelve-year rotation.)

190. The new working plan prescribed a rotation of twenty-five years under the system of ' coppice with standards.' The annual yield was regulated by area. Felling was prohibited to a width of one chain on either side of streams. The number of standards to be retained was fixed at 20. The working plan aimed at an improvement in the condition of the crop and the attainment of evenly graded blocks of forests well stored with standards, which would serve to supply small timber.

191. Sanction was accorded in 1910 to work part of Herur reserve for fuel on a thirty-year rotation. The western part of the reserve was excluded from fuel operations, being poorly stocked.

192. In 1911 sanction was accorded to revise the fuel working circles of Coondapoor range as follows :—

Nujinane and Talaburane were constituted into one felling series and the rotation was increased to thirty years, and coupes were revised accordingly. Jennalane was included with Korakoppadahola to be worked on a thirty-year rotation. Since the prescriptions of Mr. Foulkes' Working Plan for Sablady reserve were not given effect to till 1917–18, orders were issued to work the reserve for fuel from 1918.

193. In 1915 Mr. Raman Menon, the District Forest Officer, proposed a revision of the fuel series of Coondapoor Range. He considered the annual coupes were too large and the rotation faulty. He prepared a revised set of working plan maps and obtained the Conservator's permission to work the coupes from 1915. The draft of the working plan did not materialize and the officer was transferred to Travancore. He had formed eleven fuel series in his revised maps and adopted a rotation of forty years. The fuel series of Coondapoor Range continued to be worked under this scheme till 1921.

194. The system of felling was changed from 'coppice with standards' to 'simple coppice' from 1921 under the Chief Conservator's orders.

195. In 1921 the Conservator of Forests ordered the District Forest Officer to reduce the number of fuel series in Coondapoor Range to two for the following reasons :—

"The present method under which a large number of coupes are felled each year has nothing to recommend it. There should be only two felling series ; one for the supply of Baindur and the other for Coondapoor. The area of the coupes to be roughly fixed so that the total yield will be the same as in past years."

The Conservator also mentioned in his inspection note that much time and efficiency were wasted in inspecting a number of fuel coupes.

196. In accordance with the Conservator's instructions Mr. G. S. Lazardo prepared a fuel scheme consisting of two felling series with a twenty-year rotation. The distribution was as follows :—

Reserve.	Coupes.	Area.
Coondapoor Felling Series.		
Hulimishipare	I to V	1,978
Kursegudde	VI	563
Herur	VII to IX	1,325
Abbigudde	X and XI	1,281
Jennalane	XII	666
Chittur	XIII to XV	1,781
Nujinane and Mudugalpare	XVI to XVIII	1,235
Korakoppahola	XIX	405
Talaburane	XX	583
Baindur Felling Series.		
Baindur	I to III	674
Kadike	IV to VIII	1,293
Karnigudde	IX to XI	823
Guruvancote	XII to XVI	1,226
Sarpanamane	XVII and XVIII.	491
Guruvanacote	IX	255

(Gundaberupare reserve was excluded as it was considered too good to be classified as a fuel reserve.)

197. In 1925 Mr. G. S. Lazardo reported to the Conservator that the contractors found it difficult to work such large coupes in Coondapoor Felling Series and submitted proposals splitting the series into two and these were approved in Chief Conservator's, Miscellaneous No. 90, dated 29th March 1925. The allocation of coupes was as follows :—

Hulimishipare coupes I to III were worked in 1922 to 1925 under the original scheme. Kursegudde, Abbigudde part, Jennalane, Korakoppadahola and Herur were divided into seventeen coupes and called the Golihole Felling Series. Abbigudde coupes I to III were worked under the original scheme from 1922 to 1925. This together with Talaburane, Nujimane, Mudugalpare and Chittur reserves were constituted into Wandse Felling Series.

198. In 1930 under the orders of the Conservator of Forests an outline of a revised fuel scheme for Coondapoor Range was submitted by Mr. Muhammad Habibullah Sahib, then District Forest Officer, in his reference No. 1566-F/28-C-1, dated 26th May 1930. Six felling series were constituted and the rotation was fixed at forty years. The essentials of the scheme were approved by the Conservator, VI Circle, but it was decided by him in consultation with the Conservator, III Circle, that the scheme should be incorporated in this working plan for the whole division. The first coupes of each of the six felling series were sold in 1931.

199. *Shankaranarayana Range.*—Sablady reserve was once worked over for fuel from 1888 to 1897.

200. This range formed one with Coondapoor Range till 1910. So in Mr. Foulkes' Working Plan for Coondapoor Range sanctioned in Board's Proceedings No. 251, dated 5th September 1902, two felling series were formed in the present Shankaranarayana Range :—

(1) Bakudihola and Surtihola—1,184·6 acres.

(2) Sablady—208·0 acres.

The rotation was fixed at twenty years and the silvicultural system was 'coppice with standards', reserving twenty standards per acre. Under the provisions of this plan, coupes I to X of Bakudihola reserve aggregating an area of 525·5 acres were worked between the years 1903 and 1920.

201. Sablady reserve was not taken up for working till 1917–18.

202. In 1910 a scheme was sanctioned to form Suraladvi and Dottinaberu into a fuel series. Only two coupes of Suraladvi were permitted to be worked before a regular working plan was got ready. Dottinaberu was never worked for fuel and was eventually eliminated from the fuel series, being too good to be constituted as a fuel series. Coupes I to XI of Suraladvi (394 acres) were worked under the provisions of the working plan from 1910 to 1922.

203. In 1911 Mavinaguli reserve was added on to Kamradihola and a scheme to work the series on a thirty-year rotation was sanctioned. Part of Kamradihola, coupes VIII to XV, was worked under Mr. Foulkes' Working Plan. Under the new scheme coupes I to XII in Mavinaguli amounting to an area of 752·82 acres were worked from 1911 to 1922 under 'coppice with standards.'

204. In 1921 the system of felling was changed from 'coppice with standards' to 'simple coppice.'

205. In 1921 along with the revision of the fuel series of Coondapoor Range the Conservator ordered the District Forest Officer to revise the fuel plan of Shankaranarayana Range. Mr. G. S. Lazarado prepared a scheme constituting Mavinaguli, Suraladvi, Kamradihola and Halakkihola reserves into one fuel series to be worked on a twenty-year rotation. Under this scheme which is still in force the following areas have been worked :—

	ACS.
Mavinaguli coupes I to IV	430
Suraladvi coupes V to VI	219
Halakkihola coupes VII to X	393

206. *Mangalore Range.*—There is only one series in this range, i.e., in Kodiamale reserve. Suitable portions of the above reserve were chosen and divided into thirty coupes in 1917 and one coupe is sold every year. The first two coupes were worked under 'coppice with standards' and the subsequent ones were worked under 'simple coppice.' Coupes I to XIII had been felled prior to 1931.

207. The following statement shows the areas felled under previous working plans :—

Name of working plan.	Felling series.	Reserve name.	Coupes worked.	Year of working.	Area in acres.
1 Mr. Barry's working scheme of 1911.	..	Nujinane	I to IV	1911–16	176·40
		Herur	Part	1911–15	408·00
		Abbigudde	I to V	1911–15	188·10
	NO.	Chittur	Part	1911–15	348·80
2 Mr. Foulkes' Working Plan of 1902 for Coondapoor Range.	I	..	Not worked	..	..
	II	..	Do.	..	..
	III	Chittur	Part	..	..
	IV	Kamradihola	VIII to XV	1902–14	447·90
	V	Korakoppa	I to IX	1902–11	293·80
	VI		Not worked.		
	VII	Bakudihola	I to X	1903–20	525·50
	VIII		Not worked.		

Name of working plan.	Felling series.	Reserve name.	Coupes worked.	Year of working.	Area in acres.
3 Mr. Foulkes' Working Plan for Udipi Range.	Andar North ..	Andar	I to XVI ..	1903–20 ..	238·00
		Chinkramale ..	XX, XXI, XXIII, XXIV and XXV.	1906–09 ..	375·00
		Manaji	I to XII	1903–15 ..	192·00
		Durgamalai ..	I	1903–04 ..	30·00
4 Conservator's C. No. 3329/11 ; scheme for Suraladvi.	..	Suraladvi ..	I to XI	1910–22 ..	394·21
5 Conservator's C. No. 981/11.	..	Mavinguli ..	I to XII	1911–22 ..	752·82
6 Mr. Raman Menon's *incomplete* Working Plan for Coondapoor Range.	I ..	Kadike	I to VI	1916–22 ..	245·35
	II ..	Baindur	I to VI	1916–22 ..	273·60
	III ..	Guruvanacote ..	I to VII	1915–22 ..	238·92
	IV ..	Kursegudde ..	I to VI	1916–22 ..	238·55
	V ..	Hulimishipare ..	I to VII	1915–22 ..	290·07
	VI ..	Herur	I to VII	1915–22 ..	294·59
	VII ..	Gunderberupare	I to VII	1915–22 ..	279·86
	VIII ..	Korakoppadahola	X to XII ..	1916–19 ..	117·30
		Jennalane ..	XIII to XV ..	1919–22 ..	113·85
	IX ..	Abbigudde ..	VI to XI ..	1916–22 ..	228·10
	X ..	Nujinane ..	V to X	1916–22 ..	249·47
	XI ..	Chittur	I to VII	1916–22 ..	321·57
7 Mo Lazarado's scheme of 1922.	Baindur ..	Baindur	I to III	1922–25 ..	567·97
	Coondapoor ..	Hulimishipare ..	I to III	1922–26 ..	857·73
8 Mr. Lazarado's scheme of 1925.	Baindur ..	Kadike	IV to VIII ..	1925–30 ..	1,138·80
	..	Karnigudde ..	IX	1930–31 ..	277·40
	Golihole ..	Hulimishipare ..	I and II	1925–29 ..	403·17
	Vandse ..	Abbigudde ..	I to III	1925–29 ..	616·50
		Talaburane ..	IV and V ..	1928–30 ..	592·90
		Nujinane ..	VI	1930–31 ..	211·40
9 Mr. Lazarado's scheme of 1922 sanctioned in Conservator's C. No. 1434-F-21-3, dated 10th April 1923.	Shankaranarayana Range.	Mavinaguli ..	I to IV	1922–31 ..	430·00
		Suraladvi ..	V to VI	1922–31 ..	219·00
		Halakkihola ..	VII to X ..	1922–31 ..	393·00
10 No Working Plan ..	Kodyamale ..	Kodyamale ..	I to XIII ..	1917–31 ..	360·33 Under-felling.
11 Fuel scheme by Mr. Habibulla Sahib prepared in 1930.	I ..	Karnigudde ..	I	1931–32 ..	73·00
	II ..	Guruvanacote ..	I	„ ..	61·00
	III ..	Kursegudde ..	I	„ ..	83·00
	IV ..	Herur	I	„ ..	50·00
	V ..	Abbigudde ..	I	„ ..	50·00
	VI ..	Chittur	I	„ ..	82·00

Results of past management of fuel reserves discussed and criticized.

208. Undoubtedly much has been done from 1902 to bring the fuel working on to a more systematic and organized basis. The permit system was put an end to and all indiscriminate fellings by still owners were stopped. The forests were worked from 1902 under a recognized silvicultural system, viz., ' coppice with standards.'

209. A very desirable change was effected in 1915 from the departmental system of working the fuel coupes to the contract system. In 1908 there were as many as forty pairs of bullocks and buffaloes stationed at Wandse, six Government boats and three ships, for departmental transportation of fuel to Coondapoor and Mangalore from the reserves.

210. Various rotations have been adopted in the past, from twenty to forty years, and in no instance was any attempt made to fix the rotation for fuel coupes on the basis of any growth data. A rotation of twenty years is undoubtedly a very short one while one of thirty years is admissible. Statistics collected indicate a rotation of forty years. The adoption of an arbitrary rotation of twenty or thirty years while displaying a lack of foresight on the part of the management has resulted in temporary over exploitation of these forests.

211. No endeavour was made in the past to restock artificially blank areas in fuel forests or to supplement ill-grown or sparsely distributed coppice areas with seedlings.

212. Tending and cleaning operations in felled coupes appear to have been ignored with the result that fast growing soft woods like *Macaranga roxburghii*, *Mallotus philippinensis*, *Trema orientalis* and other shrubs have readily taken hold of the soil to the detriment of the coppice shoots. Creeper and climber cutting in fuel coupes have received little or no attention in the past.

213. Reduction in the number of felling series from eleven to three in Coondapoor Range in 1921, considerably dislocated fuel working in the range, with a consequent fall in revenue. The grant of facilities to villagers for the collection of their requirements of fuel and manure leaves from annual coupes, and the possibilities of obtaining better prices for fuel coupes if smaller areas were put up for auction, seem to have been overlooked by

the officers concerned. Large annual coupes, in some cases amounting to 300 acres in one block, were put up to auction. Competition was low and contractors would not risk the large outlay of capital involved in working such big fuel coupes. The wisdom of this change in policy is open to criticism.

Bamboo.

214. Prior to the year 1902 the right to collect bamboos from fixed annual coupes of reserved forests was sold in public auction at rates varying from Rs. 1–12–0 to Rs. 4 for every 100 bamboos collected. Permits for the collection and removal of the produce from the forests were issued to the contractors by the Range Officer.

215. Under Mr. Foulkes' Working Plan for Coondapoor Range sanctioned in Board's Proceedings No. 251, dated 5th September 1902, a bamboo working circle was constituted out of the following reserves :—

	ACS.
Part of Mettukalgudde	1,350
Part of Tombattu	1,784
Part of Surikodlu	1,016
Total ..	4,150

The working circle was divided into five annual coupes and the rotation was fixed at five years. Enumerations were done over sixty acres and it was reckoned that ten mature bamboos would be available on an average from each clump. The annual yield was determined on the proportionate basis of enumerations made to the area represented in the annual coupe. The following regulations were prescribed regarding felling :—

(1) Culms were to be felled within 1½ feet from the ground.

(2) All saleable bamboos from one clump to be extracted before commencing felling in the next clump, provided, however, not less than seven culms were left behind in each clump exclusive of immature bamboos.

(3) Fellings were to commence from the north-eastern corner of the coupe and should proceed progressively towards the west and south.

(4) Debris of old fellings was to be removed from the clump at the time of bamboo extraction.

(5) Bamboos were allowed to be sold in all timber and fuel coupes open to cutting in any year.

216. Under the prescriptions of the working plan the bamboo fellings in reality amounted to a sort of cultural operation consisting of a cleaning of the clumps. With a view to secure that this operation was carried out efficiently the working plan prescribed that the fellings should be done departmentally ; but if the work was given on contract favourable terms were recommended to be extended to the contractor.

217. In accordance with the prescriptions of the above working plan bamboo fellings in this working circle were carried on for three rotations from the year 1903 to 1919.

218. In Conservator's R.O.C. No. 799/10, a scheme was sanctioned for felling bamboos in the reserves of Halakkihola, Balkattehola, Ballimane, Tenkahola, Suralädevi, Jarkalane, Dottinaberu, Vadanaberu, Surtihola and Bakudihola reserves of Shankaranarayana Range on a five-year rotation. Under this scheme fellings were done for one rotation from 1918 to 1922.

219. Another bamboo working circle was constituted in Mr. Foulkes' Working Plan for Udipi Range sanctioned in Board's Proceedings No. 252 of 1902. Matkalgudde, Jarvattukadu, Jatkatmale and Mavinakodlu reserves were included in the working circle. The rotation was five years and prescriptions regarding fellings were the same as those enumerated above for Coondapoor Range.

220. In Conservator's R. Dis. No. 1829/06 sanction was accorded to extract bamboos from Durgamalai reserve.

221. Owing to the flowering and consequent dying back of bamboos throughout the division from 1917 to 1923 bamboo working had to be suspended ; the existing stock consists of regeneration and consequently the reserves will not be fit for bamboo extraction during the period of this plan.

Sandal.

222. Very little attention appears to have been bestowed on sandal in South Kanara prior to 1913. Reference has already been made to the time immemorial practice of transporting sandalwood from Mysore and Coorg to Karkala for purposes of distillation of the

essential oil there. Taking advantage of this practice sandal thieves were in the habit of stealing large quantities of sandalwood from the unreserves and reserves round about Karkala and Mudabidri. In 1913 illicit removal of sandal was carried on, on such a large scale that it attracted the notice of the Collector, Mr. Couchman, and the District Forest Officer Mr. Raman Menon, who jointly endeavoured to put an end to this loss of revenue, by appointing a special magistrate to inquire into and investigate sandalwood thefts in the division. Many thefts were investigated and some offenders were prosecuted and convicted ; in other cases the offences were compounded for very large sums. At the same time proposals were submitted to the Conservator for extraction of sandalwood from the reserves and unreserves of the division but they failed to meet with his approval.

223. In 1915 sandalwood transit rules for the division were sanctioned ; but in spite of these special transit rules large scale thefts continued. Sandal trees were felled and converted into chips in situ and transported to Karkala, as though they were brought from Mysore or Coorg ; prevention was difficult as a property mark cannot be affixed to chips.

224. In 1918 a scheme for artificial regeneration of sandal by direct sowings at a regular espacement, in Todar and Hosabettu reserves, was sanctioned by the Conservator of Forests in his R.O.C. No. 2223/18-1, dated 7th August 1918, at the instance of the District Forest Officer, Mr. J. Sadasiva Ayyar. Under this scheme Todar and Hosabettu reserves were each divided into ten compartments and direct sowing of sandal seeds in prepared patches at an espacement of 12′ × 12′ was prescribed over one compartment in each reserve every year. From 1918 to 1923 the first five compartments of each of the two reserves were sown at a total cost of Rs. 271–11–0 for Todar, and Rs. 250–3–0 for Hosabettu, reserves. Further sowings were abandoned in 1923 under the orders of the Conservator as the results of previous sowings were unsatisfactory.

225. In 1917 a scheme was prepared by Mr. J. Sadasiva Ayyar to carry out improvement fellings in Nire and Vorwady reserves, with the object of improving the stock of sandal. The scheme was sanctioned by the Conservator of Forests in his R.O.C. No. 2910/17-1, dated 10th October 1917, for a period of four years. Under this scheme the two reserves were divided into four compartments each, and improvement operations were prescribed and carried out over one compartment every year from 1917. Improvement operations consisted in the removal of all climbers and inferior species interfering with the development of sandal. This beneficial operation has no doubt improved the condition of the sandal stock to an appreciable extent.

226. Sandalwood thefts were still going on and the limited staff could not cope with the work of protection. It was therefore considered desirable to extract all sandal trees from reserves and unreserves, and accordingly extraction commenced in the unreserves of Udipi Range in 1920 and was continued till 1926, when it was found that there was no further scented sandal left for extraction. Similarly in Mangalore Range extraction of sandal was done from the year 1920 to 1927, and in Shankaranarayana Range from 1925 to 1927. In Coondapoor Range sandal was extracted from unreserves consecutively for five years from 1925. In these operations various girth limits from 10 to 18 inches were adopted, presumably with the idea of exterminating scented sandal from the unreserves.

227. In their Order Mis. No. 1461, dated 4th November 1922, Government accepted the recommendation of the Chief Conservator of Forests that the policy of the department should be to encourage the kumakidars to conserve the sandalwood in their 'kumakis,' and that they should be adequately remunerated when the trees were extracted by the Forest Department.

228. In 1924 in answer to an interpellation in the Madras Legislative Council, regarding the responsibility fixed on kumakidars for the loss of sandal trees from their 'kumakis, the Chief Conservator of Forests reported to Government in his No. 8230/24-2, dated 4th April 1925, as follows :—

> " It is not worthwhile to attempt to conserve sandalwood in South Kanara. The district is essentially a timber district and in my opinion the activities of the Forest Department should be concentrated on trying to restore the forests proper to something approaching their original condition before they were subject to the pernicious system of 'Kumri.' Sandalwood does not and cannot grow in timber forests ; it is scattered over the waste lands and the 'kumakis' of the more open country and any attempt to protect and foster its growth involves dissipation of energy which could be more profitably employed in improving the timber forests. There are hundreds of square miles in other districts where conditions are much more favourable to the propagation and protection of sandalwood and where little else of value will grow."

229. On this, Government, in their Order Mis. No. 891, Development, dated 18th June 1925, considered it inadvisable to continue the policy of encouraging sandalwood in 'kumaki' lands and directed that sandalwood trees should be uprooted as soon as possible

and sold in auction. The Chief Conservator of Forests however ordered that trees that did not contain scented wood need not be uprooted. None of the above orders contemplated extraction of sandalwood from the reserves. Owing to a mistaken understanding of the orders sandal trees of and over 10 inches in girth in the reserves of Mangalore Range were extracted in 1925-27. Similar extraction was done in Coondapoor Range in 1927–28.

230. In 1930 on a reference by the District Forest Officer to the Conservator regarding the extraction of mature sandal trees from reserves the latter ordered that pending a decision by the working plans staff a girth of 36 inches could be tentatively treated as the exploitable size for living sandal trees.

Cutch.

231. The occurrence of *Acacia sundra* is a special feature of Coondapoor Range and from the early years of forest administration the value of this tree in the district appears to have been recognized and steps were taken to work it on a more or less organized basis.

232. A lease to extract *Acacia sundra* trees for five years from Herur, Darlegudde, Honokodlu, Herkur, Mudaregudde, Kassankatte, Abbigudde and Talaburane reserves was granted in 1863 for Rs. 2,000 per annum.

233. Subsequently permission to fell under taluk supervision was extended. The manufactured product was sold in public auction, the collectors of the produce being givēn 75 per cent of the price obtained per candy of 4,000 balls. (Each ball weighs 4 to 6 tolas.)

234. In 1885 contract working under departmental supervision was introduced. About ten tons of cutch were annually manufactured by a contractor under departmental supervision, and the department sold the produce in public auction and paid the contractor at an agreed fixed rate per candy. The average price obtained was Rs. 700 per ton. (Four candies make one ton.)

235. In 1886 the cutch operations were carried out on contract and the annual output of ten tons was obtained mostly from 'Halsanad.'

236. In 1889 Mr. Peake placed the working of cutch on a secure and sound basis. His aim was—

(1) to prevent overcutting for the sake of revenue ; and

(2) to organize the manufacture of cutch on such lines as to produce only the very best quality of the product.

237. In 1895 *Acacia sundra* trees were felled over fixed areas in rotation. Mr. Hooper remarked in his inspection note of 1895 that "Reproduction by coppice can be assured provided the stumps are not subjected to damage from cattle in its first three years and from fire up to the age of five or six. Shoots protected from cattle and fire attain a height of ten feet in three years. Natural regeneration by seeds is not a success."

In that year ten tons of manufactured cutch were obtained from 1,600 trees of and above 15 inches in girth. An attempt was also made to assess the value of the stock of *Acacia sundra* trees in the reserves, by enumerating sample plots of 1 to 4 acres in each reserve. Ring countings were made on a large number of stumps and a rotation of 28 to 30 years was arrived at. Unfortunately the girths of the stumps are not now on record. Only trees of and over 18 inches in girth appear to have been extracted.

238. In his working plan for Coondapoor Range sanctioned in 1902, Mr. Foulkes formed a cutch working circle comprising the *Acacia sundra* areas in the coastal reserves and unreserves of Coondapoor Range. The extent of this working circle was 23,195 acres. He prescribed working the unreserves during the period of his plan as there was ample stock available in unreserves to meet the demand. His remarks are quoted below :—

> "The principle of the past should hold good for the future, viz., to utilize first the catechu on the areas lying outside the catechu reserves proper. Thus for the next ten years taking a basis of 15 tons a year, there will be no need to touch the catechu in the catechu reserves proper, which latter may be regarded as a compensation area ; that is to say it will not be worked for the next ten years unless a European market is secured, in which event the 15 tons a year for the local country demand can be manufactured from the areas as allotted in the statement of fellings and the European demand from the reserves included in the catechu working circle.
>
> In all other respects the catechu will be manufactured in the same method as heretofore unless of course the European market (if secured) requires catechu in shape other than balls."

239. In accordance with the prescriptions of the above working plan *Acacia sūndra* felllings were confined to unreserves from 1903 to 1911.

240. In 1910 Mr. Lodge remarked as follows :—

" Catechu is cut annually on unreserved lands but this cannot continue indefinitely and areas in reserves must be specially set aside for the growth of catechu trees which will have to be raised by planting until the planted area is large enough to form a catechu working circle and supply sufficient wood for the manufacture annually of 12 to 15 tons of catechu. Each plantation to have sufficient fuel attached to it."

241. In 1911 and 1912 since the areas allotted in Mr. Foulkes' Working Plan did not yield the required number of *Acacia sundra* trees, fellings were resorted to in the unreserves near Golihole and Yelajit. In approving this deviation the Conservator ordered the District Forest Officer to prepare a systematic working plan for the cutch areas of Coondapoor Range.

242. In 1913 a working scheme prepared by Mr. Raman Menon for five years was approved by the Conservator. The following areas were allotted for working :—

1913–14	Unreserves near Kassankatte.
1914–15, 1915–16	Area south of Baindur reserve.
1916–17	Kalthod village.
1917–18	Sarpanamane.

Trees were marked by the Range Officer and sold standing to contractors by private tender. The scheme operated till 1918.

243. In 1918 Mr. McCarthy, Conservator of Forests, in referring to the rate of growth of *Acacia sundra,* remarked as follows :—

" The coppice of 1906–07 is already sometimes 18 to 20 inches in girth and the whole of it will evidently be ripe enough for a second felling in five years more. The rotation for catechu would appear to be about 15 years. The outturn is about 4 per cent by weight of wood put into the boilers. The private outturn of catechu is about the same as ours, 15 tons."

244. From 1918 to 1921 unreserves near Marnarkatte, south of Golihole-Khambadkom road, Idur, and adjoining Talaburane, Jennalane and Chittur reserves were worked.

245. From the year 1921, for the departmental manufacture of cutch was substituted the sale of standing trees to contractors, by auction or tender.

246. In 1921–22 about 1,500 trees were marked for felling in Kassankatte, Abbigudde and Talaburane reserves and sold at Rs. 5 per tree.

247. In 1922–23 trees in the western portion of Herur reserve and in Survey numbers 244 and 239 of Shirur village were marked and sold.

248. Under the orders of the Conservator, Mr. B. S. Kesava Vittal, Extra Assistant Conservator of Forests, attached to the division carried out enumerations in Baindur section. Further work had to be stopped due to lack of funds. A tentative scheme forming the area enumerated in Baindur section into ten coupes with an annual yield of about 1,600 trees was put up to the Conservator and sanctioned for two years only in his No. 317/23, dated 2nd August 1924. The District Forest Officer was at the same time ordered to prepare a complete plan for all the cutch areas of the range. Coupes I and II under the tentative scheme were worked in the years 1923 to 1925. Differences between actual outturn and the estimated yield amounted to about 25 per cent in both the years of working.

249. The working plan prepared by Mr. G. S. Lazarado, for the cutch areas of Coondapoor Range, was sanctioned in Chief Conservator's Proceedings No. 150, Press, dated 15th June 1925. The working plan expires in 1932. The following are the essential prescriptions of the above plan :—

(*a*) Areas included were portions of coastal reserves and unreserves of Coondapoor Range.

(*b*) Further enumerations were carried out in Wandse section, and the total estimated number of trees of and over 24 inches in girth was 19,500.

(*c*) Two felling series were constituted, one comprising the areas round Baindur and the other round Wandse.

(*d*) The rotation was fixed at 28 years.

(*e*) The felling cycle was seven years.

(*f*) The exploitable size was fixed at 24 inches and above in girth at breast height.

(*g*) The annual yield was fixed by number of trees with delimitation of coupes as well. For Baindur Series the annual yield was fixed at 1,500 trees and for Wandse Series 1,000 trees.

(*h*) Regeneration to be assisted by sowing seeds in portions of reserves which formed cutch coupes early in June.

(*i*) Parts of reserves forming annual coupes were closed to grazing for three years from felling.

250. In accordance with the prescriptions of the above plan coupes I to V of Baindur Series and coupes I to III of Wandse Series were sold between the years 1925 and 1930. In the last two years there has been no demand at all for cutch and the coupes remain unsold.

251. The regeneration measures suggested in the above working plan were vague and have been subjected to a lot of controversy during the last few years. The working plan stated as follows :—

"Regeneration may be assisted by sowing seed in such areas early in June."

This prescription involved the artificial regeneration of about 8,315 acres during the currency of the plan. It was impracticable and the recommendation to introduce *Acacia sundra* in felled fuel coupes is open to criticism, on silvicultural grounds. Only chosen areas were regenerated artificially with *Acacia sundra*, on which the following brief notes are recorded.

252. In 1926–27, 120 acres of cutch bearing areas in Baindur reserve were aligned, staked 12′ × 12′, pitted 1′ × 1′ × 10″, fenced and sown with *Acacia sundra* seeds in July. One weeding and mulching was done in January 1927. Germination was cent per cent successful. Subsequently seedlings died in large numbers due to too heavy overhead cover and drip. In January 1927 survivals amounted to only 50 per cent and in May 1927 to only 10 per cent :—

Cost of formation.

	RS.	A.	P.
Collection of seed	15	0	0
Cutting stakes	19	12	0
Lining and staking	140	9	0
Pitting	79	0	0
Sowing	20	0	0
Fencing	78	2	0
Total ..	**352**	**7**	**0**

Weeding and replacement of casualties were done in 1927–28 at a cost of Rs. 185–12–0. In March 1928 survivals amounted to 20 per cent. Thirty acres of the above area, in which results of original sowings were poor, were weeded in 1928–29 at a cost of Rs. 19–8–0. Thirty-one and a half acres were tended and re-sown in 1929–30 at a cost of Rs. 87–9–0. The total costs of this plantation is therefore Rs. 645–4–0.

The Conservator inspected the area in 1930 and remarked as follows :—

"It is no use expending money indefinitely in a vain attempt to prevent the smothering of the young *Acacia*. The District Forest Officer should examine this area minutely and decide which portions should be abandoned and which retained as *Acacia* plantation, and he should then concentrate future tending on the rest of the area in which he is confident of being able to bring the *Acacia* to safety within a reasonable time."

The area determined to be fit for retention as plantation is 31·5 acres.

253. Another area of 75 acres in Baindur reserved forest (also included in the fuel series) was sown with *Acacia sundra* at an espacement of 12′ × 12′ in 1927–28. The percentage of success in April 1928 was only 53. Many seedlings died during the hot weather. The area was re-sown in 1928–29 and was twice weeded in November and December 1928. In May 1929 survivals amounted to 65 per cent. Tending was done in 1929–30. The total cost of the plantation is Rs. 657 or Rs. 8–12–0 per acre.

254. In 1928–29 an area of 13 acres was sown at an espacement of 12′ × 12′. In May 1929 survivals were only 33 per cent. Blank patches were re-sown and two weedings were done in 1929–30.

255. An area of 36 acres (outside the fuel series) in Honokodlu reserve was sown in 1928–29 at 12′ × 12′. In May 1929 survivals amounted to 91 per cent. Tending and replacement of casualties were done in 1929–30. The cost of the plantation till 1930 is Rs. 264–10–2.

256. In 1928–29 an area of 40 acres in Mudaregudde (outside the fuel series) was sown at 12′ × 12′. In May 1929 the percentage of survivals amounted to 96. In 1929–30 the area was tended. The total cost of the plantation till 1930 is Rs. 276–7–11.

257. In 1929–30 an area of 34 acres in Herur reserve (outside the fuel series) was regenerated with *Acacia sundra.* Thirty-two acres were sown with seeds at 12′ × 12′; two acres were planted with stumps and seedlings as an experimental measure. In May 1930 the percentage of success was nearly 95. The cost of the plantation till 1931 is Rs. 197–12–0.

258. The results of the regeneration operations conducted from 1926 to 1930 indicate—

(1) That areas with a dense cover of fast growing fuel species are unsuited for raising *Acacia sundra* artificially in pure woods. Regeneration operations carried out in Baindur reserve, in felled fuel coupes, have proved mostly a failure and uneconomical, owing to heavy shade and drip from fast growing fuel species and incidental high cost of tending.

(2) The species prefers a poor disintegrated lateritic soil with light shade in youth.

(3) Planting with seedlings or stumps is still in an experimental stage and no conclusions can be derived at present. Direct sowings have given fairly satisfactory results so far and they should not be given up unless the extra development in the case of planted seedlings or stumps is sufficiently rapid to justify the extra cost incurred in raising them.

(4) One point open to criticism in past regeneration operations is the sowing of seeds in these areas as late as June, probably after the monsoon has burst. Sowings should preferably be done towards the end of April or early in May. By the time the monsoon bursts the seedlings should have developed sufficient root system to withstand the wash.

Minor Forest Produce.

259. The collection of minor forest produce is a special feature of South Kanara. Until 1890 the method of collection was through the agency of 'shop-keepers,' who were generally the village patels. They received advances from the tahsildars who in their turn were advanced by the District Forest Officer. The 'shop-keepers' used to pay cash for the collection of minor forest products and at the end of the month submitted the produce collected, as well as, their cash accounts to the tahsildar concerned. The produce was sold in auction at stated intervals at the taluk headquarters by the tahsildars. Monthly cash accounts were submitted by the tahsildars to the District Forest Officer with a statement of accounts regarding the receipt and disposal of the products. The village patels carried on the collection not with any interest in it, but as a matter of routine, because they were expected to do it by the tahsildars. The quantity of produce collected every year was very fluctuating; the reason for this was unascertainable at the time. It may have been due to fraud or to good or bad seasons for the produce.

260. In 1892 the system of departmental collection of minor produce was changed to one of farming it out in blocks; this practice continues to the present day. The reserved forests and reserved lands of the division were divided into a suitable number of small farms and the right to collect minor produce from each was sold annually. Similarly the unreserved lands of each taluk were divided into farms and leased out annually. This change in the system of collection considerably augmented the revenue realized under this head. Moreover relief to the department in supervision and checking was considerable. Annual auctions are held by the concerned tahsildars and the sales are subject to confirmation by the District Forest Officer.

Grazing.

261. Immense facilities for grazing are afforded by the extensive areas of forest-clad waste and unreserved lands of the district, as well as by the existence of privately-owned forest lands combined with the peculiar privilege of 'Kumaki.' Until 1892–93 no grazing fees were levied in South Kanara; from that year onwards however licences were issued to graze cattle in the reserves for a nominal fee.

262. All reserves except areas under regeneration are open to grazing now on payment of an annual fee of six annas for a cow or a bull, and ten annas for a buffalo.

Fire protection.

263. Systematic fire protection on organized lines was commenced in the year 1885–86 under the orders of Mr. Peake then the District Forest Officer. Fire lines were cleared and burnt, and fire watchers were appointed to patrol the lines during the fire season. The

subjoined statement shows the reserves that were specially fire protected and the cost of the operation, up to 1895 :—

Reserve.	Area.	Cost.
	ACS.	RS.
Sarpanamane	150	306
Sablady	208	319
Chinkramalai	2,538	1,813
Manajekadu	422	782
Pillarakan	320	195
Tenkahola	228	1,070
Todar	392	320

The protection afforded was uniformly rigid and successful. The reason for specially fire protecting the above reserves in preference to the others was that they were the ones originally reserved under the 'jungle conservancy.' Regeneration areas were also specially fire protected.

264. In 1894 special protection was extended to Mujimalai, Herkur, Mudaregudde, Herur, Darlegudde, Kassankatte and Doddinamane reserves. Though fire lines were cleared and burnt round the above reserves no special watching establishment was employed during the fire season.

265. In 1895 an examination was made into the question of continuing such an expensive measure of protection, but no changes were effected in the prevailing system in that year. The necessity to afford special fire protection to regeneration areas was emphasized at the time.

266. The policy of 1894 was continued in 1897 also with the addition of rigid protection to areas under 'located fellings.'

267. The following regulations were laid down in Mr. Foulkes' Working Plan for Coondapoor, Udipi and Mangalore Ranges sanctioned in 1902.

268. Reserves which were till then receiving special fire protection continued to receive it. Therein protection consisted in burning a line round the reserves and appointing fire patrols during the hot season. The width of the exterior lines was recommended to be increased to 25 feet. The reserves so included under special protection were Sarpanamane, Savanthagudde, Karnigudde, Kadike, Baindur, Talaburane, Abbigudde, Chittur, Herkur, Mudaregudde, Darlegudde, Herur, Honokodlu, Sablady, Kassanakatte, Chinkramalai, Pillarkan, Manajekadu, Tenkahola, Todar, Hosabettu, Kodiamale, Mujimalai and Nananjimalai. Timber coupes were also specially fire protected and the timber working circle in Someshwar reserve was also given protection. In addition to the above reserves the following also were included in the list of reserves to be specially protected, Jarvattukadu, Mavinakodlu, Halesomeshwar, Mensinkan, Jatkatmale, Metkalgudde and Durgamalai. A beginning was made by burning grass to a width of 150 feet along the Mysore border to protect the ghat slopes against fire from the Mysore forests.

269. The existing system of fire protection consists of :—

A. Special protection.

(1) Early burning grassy areas on the ghats. The area annually treated under this method is about 3,500 acres.

(2) Ordinary protection of some of the more important ghat and foothill timber reserves as well as some of the fuel reserves of the plains portions. Protection consists of clearing and burning fire lines round the reserves and fire tracing all important and much frequented paths and cart-tracks. No watching establishment is employed. The area so treated is about 50,000 acres.

(3) Rigid protection of the more important timber, fuel or sandal reserves as well as timber coupes and regeneration areas. The method consists of the employment of special fire watchers during the hot weather season in addition to the usual clearing and burning of fire lines. The area under this method of protection is about 19,000 acres.

B. General protection.

This nomenclature is misleading as in practice nothing is done to reserves coming under this category, except the annual clearance of reserve boundary lines and inspection paths by the subordinate staff "free of cost." Reserves which are not normally susceptible to annual fires are grouped under this class.

270. The following statement shows the reserves classified under the above methods of fire protection :—

Range.	Kind of protection.			
	Special.			General.
	Early burning.	Ordinary.	Rigid.	
Mangalore.	Naravi Part.	Hurabe.		
		Nananjimalai.		
		Kodiamale.		
		Kodialmale.		
		Mujim alai.		
		Panamberi.		
		Naravi (lower).		
		Todar.*		
		Hosabettu.*		
Udipi.		Chinkramale.	Regeneration areas.	Manaje.
		Jatkatmale.	Someshwar.	Pillarkan.
		Halesomeshwar.	Jatkatmale.	New Someshwar.
		Someshwar.	Halesomeshwar.	
		Mensinkan.		
		Nire.		
		Vorwady.		
		Andar.		
		Naravi (lower)		
		Durgamalai.		
		Jarvattukadu.		
		Mavinakodlu.		
		Metkalgudde.		
Shankaranarayana.		Suraladevi.	Bakudihola.	Mettukalgudde.
		Balkattehole.	Kamradihola.	Sablady.
		Vadanaberu.	Mavinaguly.	Surikodlu.
		Jarkalane.	Halakkihola.	Surtihola.
		Dottinaberu.	Doddinamane.	
		Bellimane.		
		Tombattu.		
		Baregundy.		
		Tenkahola.*		
Coondapoor.		Chittur.	Herur.	Kassankatte.
		Abbigudde.	Gunderberupare.	Koraticalbare.
		Nujinane.	Korakoppadahola.	Madibare.
		Kursegudde.	Hulimishipare.	Megany valley.
		Baindur.	Madibare timber coupes.	Mensingudde.
		Kadike.	Regeneration areas.	Mudaregudde.
		Talaburane.		Mudugalpare.
		Karnigudde.		Murkodihola.
				Nagankalpare.
				Sarpanamane.
				Savanthagudde.
				Darlegudde.
				Guruvanacote.
				Hannarmagane.
				Herkur.
				Harmannu.
				Honokodlu.
				Hullumurudubare.
				Jennalane.

* Under village panchayats and protected by them.

271. The existing practice of having different widths of fire lines for each range has nothing to recommend it. For example in Shankaranarayana Range the exterior lines are only 6 feet wide and the interior ones 10 feet, whereas in Udipi Range the width is 20 and 12 feet respectively.

272. Statement of fire occurrences is furnished under section 2, Chapter II of Part I of this plan.

SECTION 3.—SPECIAL WORKS OF IMPROVEMENT UNDERTAKEN.

273. *Roads.*—The following statement gives a list of the roads in the area covered by this plan, showing the cost of construction and cost of annual maintenance, when available :—

Name and description.	Length. M.	Length. F.	Cost of construction. RS.	Approximate figures of annual maintenance. RS.
MANGALORE RANGE—				
1 Kodiamale bridle path	1	5		
2 Coupe road in Kodiamale reserve	0	3	211	60
UDIPI RANGE—				
1 Rayarkan road	3	3	223	90
2 Modecary track	1	4	137	50
3 Road in continuation of road No. 27	0	4	95	..
4 Thingle road	3	4	485	90
5 Karkal-Durgamalai road	2	4	368	75

Name and description.	Length.	Cost of construction.	Approximate figures of annual maintenance.
	M. F.	RS.	RS.
UDIPI RANGE—*cont.*			
6 Hale-Someshwar road	4 2	1,023	125
7 Road in Pillarakan reserve	0 7	57	30
8 Feeder road to Someshwar coupe II	1 0	95	
9 Road from Local Fund road to Kokkarani	1 3	472	50
SHANKARANARAYANA RANGE—			
1 Hennabail-Karur road	3 6	2,292	120
2 Mavinaguly road	0 7	208	30
3 Halady-Rathady road	1 1	388	40
4 Suraladevi road	1 0	312	20
5 Bakudi coupe road	0 2	30	..
6 Feeder road to Dodinamane coupe III	0 3	33	..
7 Do. IV	0 2	69	..
COONDAPOOR RANGE—			
1 Wandse-Kollur road to Abbigudde reserved forest	3 0	772	90
2 Kadike road	2 6	..	80
3 Herur-Halimishipare road	7 0	1,390	210
4 From Hoigundy river to Herur reserved forest	1 1	180	30
5 Guruvanacote road	0 7	294	30
6 Road in Chittur reserve to Local Fund road	5 0	130	..
7 Madibare road, No. I	0 4	66	..
8 Madibare road, No. II	0 5	142	..
9 Wandse-Nujinane road	3 0	1,302	100
10 Gunderperupare road	0 4	336	..
11 Feeder road in above reserve	1 3	207	..
12 Ragchittlu-Kursegudde road	4 4	1,167	125
13 Jennal-Gunderberu road	4 0	1,200	80
14 Nujinane road extension to Mudugal	2 2	600	120
15 Chittur new coupe road	2 3	925	40
16 Wandse-Kollur road to Madibare coupe III	3 1	347	..
17 Feeder road to and in coupe IV Madibare	2 5	276	..
18 Korakoppadahola road	0 3	100	..

274. *Buildings.*—A list of forest buildings in the working plan area, or in its vicinity, or at the district or range headquarters, is given below :—

Name and description.	Construction or acquisition.		Present book value.	Approximate figures of annual maintenance.
	Year.	Cost.		
		RS.	RS.	RS.
MANGALORE RANGE—				
1 District Forest Officers' quarters at Mangalore with outhouses	1928	17,971	17,971	300
2 Forest Range Office at Mudabidri	1915	761	721	30
3 Range Officer's quarters at Mudabidri	1915	2,453	2,235	30
4 Forest rest-house at Naravi with outhouse	1917	2,686	2,656	20
5 Forest guard's quarters at Naravi	1927	835	826	12
6 Do. Naravi No. 2	1905	122	120	8
7 Do. Bangady	1905	124	120	8
8 Do. Nellikar	1924	827	795	8
9 Do. Kodiamale	1924	879	823	12
UDIPI RANGE—				
1 Forest Range Office at Karkal	1925	2,907	2,894	50
2 Forest Range Officer's quarters at Karkal with outhouse	1917	2,846	2,698	40
3 Forester's quarters at Sitanady	1918	691	674	15
4 Do. Sitanady No. 2	1925	1,047	1,028	15
5 Forest guard's quarters at Sitanady	1917	457	442	10
6 Do. Sitanady Double	1925	1,398	1,375	12
7 Forester's quarters at Ajekar	1922	1,169	1,160	15
8 Forest guard's quarters at Hebri	1902	146	140	10
9 Do. Pillarkan	..	88	75	10
10 Do. Kervashi	1922	654	645	10
11 Do. Nire	1924	776	765	8
12 Do. Double at Hosabandy	1928	1,547	1,530	12
13 Do. Double at Andar	1929	1,410	1,387	12
14 Inspection shed at Kervashi	1930	2,276	2,276	20
SHANKARANARAYANA RANGE—				
1 Forest Range Office at Shankaranarayana	1911	748	729	25
2 Forest Range officer's quarters	1913	2,172	2,072	50
3 Forester's quarters at Amashebail	1922	1,097	1,091	12
4 Forest guard's quarters at Amashebail	1927	826	814	10
5 Forester's quarters at Neralkatte	1922	825	814	12
6 Double forest guard's quarters at Neralkatte	1923	877	866	12
7 Forester's quarters at Siddapur	1924	978	968	15
8 Double forest guard's quarters at Siddapur	1926	1,214	1,210	12
9 Forest guard's quarters at Albady	1921	404	400	10
10 Forest range clerk's quarter at Shankaranarayana.	1929	975	971	10
11 Forest range peon's quarters at Shankaranarayana	1929	757	753	7

Name and description.	Construction of acquisition.		Present book value.	Approximate figures of annual maintenance.
	Year.	Cost.		
		RS.	RS.	RS.
COONDAPOOR RANGE—				
1 Forest Range Office at Coondapoor	1892	2,449	2,446	60
2 Forest Range officer's quarters at Coondapoor ..	1919	3,823	3,258	50
3 Forest rest-house at Kadike	1899	1,880	1,814	20
4 Do. Alur	1904	1,326	1,176	20
5 Inspection bungalow at Wandse	1909	1,625	1,517	40
6 Inspection shed at Jadkal	1927	765	760	20
7 Inspection shed at Kollur	1930	400	400	20
8 Forester's quarters at Wandse	1909	787	779	15
9 Cattle-shed at Wandse	1908	575	562	..
10 Cartmen quarters at Wandse	1908	384	379	..
11 Forester's quarters at Jadkal	1922	855	847	15
12 Forest guard's quarters at Jadkal	1905	139	135	..
13 Forest guard's quarters to accommodate three at Jadkal	1924	1,457	1,449	25
14 Forest guard's quarters at Alur	1921	329	325	8
15 Do. Kadike	1921	405	400	8
16 Do. Baindur	1921	1,022	911	10
17 Do. Baindur No. 2 ..	1927	748	742	8
18 Forester's quarters at Hoigundy	1916	767	758	10
19 Forest guard's quarters at Hoigundy	1921	405	403	8
20 Do. Shirur	1924	753	749	8
21 Do. Vasrehole	1924	736	720	8
22 Do. Golihole	1926	762	751	8
23 Double forest guard's quarters at Kerady ..	1926	1,348	1,344	12

275. *Improvements to water-supply.*—The following list shows the wells constructed in the working plan area :—

Range.	Locality.	Construction.	
		Year.	Cost.
			RS.
Mangalore	Mangalore for District Forest Officer's quarters	1928	1,229
	Mudabidri Range quarters	1915	396
	Naravi forest rest-house	1917	353
	Nellikar forest guard's quarters	1924	323
Udipi	Karkal Range Officer's quarters	1920	662
	Sitanady forest guard's quarters	1920	375
	Hebri forest guard's quarters	1921	48
	Keravashi forest guard's quarters	1922	89
	Nire forest guard's quarters	1924	308
	Hosbandi forest guard's quarters	1927	45
	Andar forest guard's quarters	1928	65
Shankaranarayana ..	Shankaranarayana Range quarters	1924	155
	Amashebail forest guard's quarters	1922	406
	Neralakatte forest guard's quarters	1927	238
	Siddapur forest guard's quarters	1928	334
Coondapoor	Coondapoor Range quarters	1919	251
	Kadike rest-house	1900	192
	Alur rest-house	1905	10
	Wandse bungalow	..	245
	Jadkal inspection shed	1927	371
	Baindur forester quarters	1925	380
	Hoigundy forest guard's quarters	1916	328
	Shirur forest guard's quarters	1925	308
	Varsehole forest guard's quarters	1924	246
	Golihole forest guard's quarters	1926	230
	Kerady forest guard's quarters	1927	386

SECTION 4.—PAST YIELDS.

276. The following tables show the past yields of the division in timber, fuel, sandalwood, cutch and minor forest produce :—

Yield of timber in cubic feet.

Year.	Hopea parviflora.	Artocarpus hirsuta.	Lagerstrœmia lanceolata.	Terminalia paniculata.	Terminalia tomentosa.	Dalbergia latifolia.	Xylia Xylocarpa.	Miscellaneous species.	Total.
				UDIPI RANGE.					
1921–22 ..	240	42	174	5,825	1,125	13	185	1,946	9,550
1922–23 ..	843	176	1,066	3,638	3,307	8	870	5,920	15,828
1923–24 ..	913	153	5,076	4,072	5,344	224	529	3,903	20,214
1924–25 ..	2,472	775	4,258	4,541	7,805	..	..	130	19,981
1925–26 ..	10,426	499	616	6,437	4,610	39	..	755	23,382
1926–27 ..	14,667	171	377	4,459	5,618	..	..	924	26,216
1927–28 ..	19,372	771	4,128	4,749	5,824	76	..	1,801	36,721
1928–29 ..	13,611	831	6,471	3,503	3,789	155	..	2,351	30,711
1929–30 ..	19,628	743	9,536	5,330	2,527	128	..	1,988	39,880
1930–31 ..	..	..	..	..	..	..	..	..	..
	82,172	4,161	31,702	42,554	39,949	643	1,584	19,718	222,483

Yield in cubic feet—cont.

Year.	Hopea parviflora.	Artocarpus hirsuta.	Lagerstrœmia lanceolata.	Terminalia paniculata.	Terminalia tomentosa.	Dalbergia latifolia.	Xylia Xylocarpa.	Miscellaneous species.	Total.
				COONDAPOOR RANGE.					
1920–21 ..	..	..	181	3,773	185	253	2,610	609	7,611
1921–22 ..	47	..	193	2,641	99	210	2,400	570	6,160
1922–23 ..	..	..	877	952	..	114	2,542	26	4,511
1923–24 ..	..	..	15,684	5,962	1,006	1,558	8,730	1,267	34,207
1924–25 ..	..	..	8,866	3,533	1,580	1,156	4,213	642	19,990
1925–26 ..	..	..	9,311	8,515	3,740	1,370	1,441	859	25,236
1926–27 ..	3,224	..	6,054	3,607	..	265	..	195	13,345
1927–28 ..	..	51	5,717	2,984	20	709	4,918	862	15,261
1928–29 ..	..	..	5,081	3,660	370	1,147	2,534	3,405	16,197
1929–30 ..	..	..	4,882	1,193	20	397	2,139	285	8,916
1930–31 ..	..	..	..	..	..	..	..	..	..
	3,271	51	56,846	36,820	7,020	7,179	31,527	8,720	151,434
				SHANKARANARAYANA RANGE.					
1923–24 ..	..	..	25	211	..	..	102	204	542
1924–25 ..	73	..	1,124	1,092	105	..	326	177	2,897
1925–26 ..	..	..	1,187	3,954	1,620	26	425	..	7,212
1926–27 ..	..	..	1,984	5,460	262	93	2,372	..	10,171
1927–28 ..	..	..	1,841	5,753	220	183	2,181	..	10,178
1928–29 ..	..	..	3,581	4,211	..	190	2,024	..	10,006
1929–30 ..	..	..	924	1,822	..	67	122	..	2,935
	73	..	10,666	22,503	2,207	559	7,552	381	43,941

Past yietds of Timber—North Mangalore Division.

1920–21 ..	..	..	181	3,773	185	253	2,610	609	7,611
1921–22 ..	287	42	367	8,466	1,224	223	2,585	2,516	15,710
1922–23 ..	843	176	1,943	4,590	3,307	122	3,412	5,946	20,339
1923–24 ..	913	153	20,785	10,245	6,350	1,782	9,361	5,374	54,963
1924–25 ..	2,545	775	14,248	9,166	9,490	1,156	4,539	949	42,868
1925–26 ..	10,426	499	11,114	18,906	9,970	1,435	1,866	1,614	55,830
1926–27 ..	17,891	171	8,415	13,526	5,880	358	2,372	1,119	49,732
1927–28 ..	19,372	822	11,686	13,486	6,064	968	7,099	2,663	62,160
1928–29 ..	13,611	831	15,133	11,374	4,159	1,492	4,558	5,756	56,914
1929–30 ..	19,628	743	15,342	8,345	2,547	592	2,261	2,273	51,731
	85,516	4,212	99,214	101,877	49,176	8,381	40,663	28,819	417,858

Past yields from North Mangalore Division.

Year.	Timber.	Fuel in chowks.*	Bamboos.	Cutch. number of trees.	Sandalwood.		
	C. FT.				QR.	LB.	TOL.
1914–15	..	..	..	..	2,004	19	33
1915–16	..	..	..	..	176	6	13
1916–17	..	..	..	..	181	23	14
1917–18	..	..	28,850	..	141	20	0
1918–19	..	..	..	..	1,067	26	16
1919–20	..	..	..	..	187	18	20
1920–21	7,611	1,096	104,178	..	82	6	10
1921–22	15,710	1,242	88,792	..	357	17	0
1922–23	20,339	4,674	146,971	11,477	1,090	23	10
1923–24	54,963	5,006	241,712	1,051	197	26	20
1924–25	42,868	5,525	161,600	275	1,702	8	0
1925–26	55,830	4,140	84,745	2,926	1,529	18	28
1926–27	49,732	4,892	1,530	1,793	905	10	30
1927–28	62,160	7,063	300	2,706	361	18	25
1928–29	56,914	4,726	..	2,631	118	3	20
1929–30	51,731	7,190	500	1,616	139	19	0

* One chowk is equal to 216 cubic feet of fuel billetted and stacked or roughly 3 tons.

SECTION 5.—PAST REVENUE AND EXPENDITURE.

277. Statements of past revenue and expenditure for the division as a whole and for each range separately, together with a statement of the past financial results of working the division are given below :—

Statement of past revenue from each range of North Mangalore Forest Division.

Year. (1)	Timber. (2) RS. A. P.	Fuel. (3) RS. A. P.	Bamboos. (4) RS. A. P.	Grazing. (5) RS. A. P.	Sandalwood. (6) RS. A. P.	Minor forest produce. (7) RS. A. P.	Miscellaneous. (8) RS. A. P.	Total. (9) RS. A. P.
				COONDAPOOR RANGE.				
1915–16	3,277 3 11	3,350 5 0	460 15 1	1,956 6 0	..	13,391 7 7	3,087 14 6	25,524 4 1
1916–17	3,502 14 1	7,794 7 8	688 7 2	1,916 4 0	..	1,837 14 6	3,655 2 0	19,395 1 5
1917–18	6,718 7 0	7,455 5 3	581 10 0	1,951 8 0	..	14,542 13 8	3,201 3 0	34,450 14 11
1918–19	6,401 4 9	8,496 10 9	290 7 5	1,803 0 0	..	7,299 15 10	2,901 1 11	27,192 8 8
1919–20	6,515 5 11	8,419 10 6	642 2 9	1,714 11 0	..	13,613 4 8	1,260 9 0	32,165 11 10
1920–21	8,498 0 5	12,507 13 5	168 12 0	2,483 0 0	150 0 0	2,518 1 6	1,167 1 9	27,492 13 1
1921–22	12,732 6 8	25,740 12 2	33 2 0	2,380 6 0	62 4 1	2,169 11 8	1,377 5 1	44,495 15 8
1922–23	10,858 9 11	17,945 14 9	6 0 0	2,250 14 0	7,250 2 1	911 1 2	1,516 15 8	40,739 9 7
1923–24	26,641 0 3	20,132 12 0	..	2,572 14 0	..	746 4 9	1,842 9 5	51,935 8 5
1924–25	17,360 6 4	13,502 0 0	627 2 11	2,496 2 0	13,160 9 0	8,045 1 1	1,688 2 8	56,879 8 0
1925–26	15,943 14 4	17,258 7 5	..	2,478 6 0	15,092 10 4	13,549 0 10	1,221 0 1	65,543 7 0
1926–27	8,588 12 5	16,009 15 10	..	2,490 2 0	8,108 8 8	8,050 0 7	2,323 13 10	45,571 5 4
1927–28	10,106 6 1	18,919 1 0	..	2,493 8 0	5,987 13 1	9,689 4 6	2,164 12 10	49,360 12 8
1928–29	13,530 6 5	11,330 8 0	0 1 0	2,530 10 0	1,772 3 8	9,211 4 2	4,182 8 11	42,557 10 2
1929–30	15,997 10 5	10,636 13 10	7 8 0	2,558 2 0	2,373 14 7	6,423 11 2	1,972 13 5	39,970 9 5
				SHANKARANARAYANA RANGE.				
1915–16	2,658 11 6	2,867 12 7	1,063 11 3	637 5 0	..	787 2 6	1,591 2 10	9,605 13 8
1916–17	3,387 7 9	2,391 15 11	1,053 0 9	605 1 0	..	1,131 1 11	1,137 6 8	9,706 2 0
1917–18	1,691 15 1	2,933 13 2	599 15 0	645 0 0	..	720 10 1	891 15 9	7,483 5 1
1918–19	1,878 13 2	3,236 2 10	789 9 0	632 4 0	..	438 12 6	438 5 0	7,413 14 6
1919–20	1,422 15 2	3,737 11 3	18 12 0	667 14 0	..	576 1 0	602 12 2	7,026 1 7
1920–21	1,352 1 0	5,022 7 5	524 8 0	1,095 0 0	150 0 0	362 7 3	457 1 6	8,963 9 2
1921–22	2,375 5 9	3,444 0 5	375 0 0	927 8 0	4,144 8 6	1,344 6 5	1,071 11 4	13,682 8 5
1922–23	2,662 1 0	7,138 4 0	306 0 0	996 10 0	..	660 7 5	1,458 14 11	13,222 5 4
1923–24	2,907 2 9	10,577 15 0	530 0 0	1,015 0 0	..	392 12 0	1,487 3 4	16,850 1 1
1924–25	4,220 7 0	5,786 1 8	..	1,142 8 0	..	314 3 1	1,210 8 5	12,673 12 2
1925–26	2,045 4 8	4,983 4 0	..	1,111 6 0	4,748 3 0	422 13 3	663 6 2	13,974 5 1
1926–27	6,654 8 5	2,403 2 6	..	1,088 2 0	4,381 9 11	206 5 9	1,794 0 6	16,527 13 1
1927–28	3,010 2 10	3,069 4 3	..	1,081 12 0	..	499 11 9	2,285 14 11	9,946 13 9
1928–29	4,462 3 7	4,095 5 2	..	1,071 6 0	..	312 15 5	1,733 11 1	11,675 9 3
1929–30	1,830 3 8	3,840 12 10	..	1,086 12 0	..	329 15 10	876 4 1	7,964 0 5
				UDIPI RANGE.				
1915–16	4,580 4 7	3,845 13 5	534 15 0	813 3 0	..	1,730 15 9	3,999 3 0	15,504 6 9
1916–17	16,534 0 10	4,905 12 10	651 0 5	749 10 0	..	1,389 14 8	2,508 15 2	26,739 5 11
1917–18	13,430 5 11	4,600 8 8	591 5 2	777 6 0	..	1,315 7 3	2,856 1 6	23,571 2 6
1918–19	13,534 11 4	2,854 0 11	647 6 1	720 6 0	..	1,189 5 3	1,724 10 2	20,670 7 9
1919–20	15,548 9 11	3,737 2 2	636 2 10	803 1 0	..	1,329 13 9	3,090 2 9	25,145 0 5
1920–21	14,447 0 7	3,453 14 7	197 12 0	1,134 4 0	150 0 0	1,002 7 2	1,362 8 6	21,747 14 10
1921–22	12,841 2 7	2,579 13 3	567 13 1	1,022 2 0	739 12 5	1,481 3 4	1,908 1 3	21,139 15 11
1922–23	18,616 15 0	3,877 15 1	2,042 12 0	958 8 0	..	891 1 4	2,841 12 0	29,228 15 5
1923–24	21,472 5 2	8,792 9 8	3,589 8 0	960 6 0	..	662 3 2	1,954 13 3	38,431 13 3
1924–25	28,687 14 5	4,724 15 0	250 10 11	1,012 2 0	1,300 0 0	1,046 14 7	4,087 1 10	45,109 10 9

Statement of past revenue from each range of North Mangalore Forest Division—cont.

Year. (1)	Timber. (2) RS. A. P.	Fuel. (3) RS. A. P.	Bamboos. (4) RS. A. P.	Grazing. (5) RS. A. P.	Sandalwood. (6) RS. A. P.	Minor forest produce. (7) RS. A. P.	Miscellaneous. (8) RS. A. P.	Total. (9) RS. A. P.
UDIPI RANGE—*cont.*								
1925–26	25,473 1 8	2,873 5 10	1,114 6 0	958 0 0	217 2 8	900 5 0	3,354 14 0	34,891 3 2
1926–27	18,624 0 2	1,395 1 7	105 0 0	918 2 0	..	470 2 5	3,200 1 9	24,712 7 11
1927–28	34,462 2 0	2,027 3 0	52 8 0	927 6 0	..	468 5 2	1,611 12 7	39,549 2 9
1928–29	28,752 4 0	2,457 7 4	19 12 0	931 14 0	..	459 4 0	2,421 11 1	35,042 4 5
1929–30	30,666 10 6	3,677 6 6	14 8 0	928 4 0	..	2,296 10 9	6,003 4 5	43,586 12 2
MANGALORE RANGE.								
1915–16	6,108 3 3	5,958 4 1	70 6 4	732 3 0	389 12 0	931 5 3	5,018 5 10	19,208 7 9
1916–17	11,983 4 5	5,805 0 2	59 1 7	742 11 0	401 13 5	1,122 9 10	5,055 10 9	25,170 3 2
1917–18	7,628 4 8	3,615 14 1	74 3 4	797 4 0	756 5 0	1,034 14 0	12,729 4 2	26,636 1 3
1918–19	11,968 9 5	5,150 3 1	10 13 0	813 12 0	8,743 12 7	14,573 0 3	4,854 7 8	46,104 10 0
1919–20	11,513 7 5	5,005 5 0	4 6 0	731 1 0	1,107 9 7	33,199 4 9	3,576 2 9	55,137 4 6
1920–21	6,420 6 6	4,206 11 4	0 1 0	1,110 12 0	1,491 0 6	746 2 2	1,895 2 0	15,870 3 6
1921–22	8,316 2 3	3,506 11 10	15 6 0	1,089 12 0	659 8 10	1,184 9 0	2,020 14 0	16,892 15 11
1922–23	11,826 12 3	5,187 13 7	13 4 0	1,189 10 0	7,258 2 1	734 14 5	2,391 12 8	28,602 5 0
1923–24	7,211 2 5	4,167 14 4	16 8 0	1,205 10 0	2,840 2 0	644 8 3	2,105 14 3	18,191 11 3
1924–25	8,691 7 0	7,088 7 7	655 4 11	1,216 8 0	8,425 11 3	815 4 6	2,243 9 11	29,136 5 2
1925–26	6,615 8 7	4,039 7 10	84 6 0	1,134 8 0	1,896 7 2	1,042 5 3	2,831 9 11	17,644 4 9
1926–27	1,687 7 2	3,774 8 10	14 6 0	944 12 0	1,554 11 2	586 6 3	2 683 11 9	16,245 15 2
1927–28	5,004 14 4	3,413 5 11	..	924 4 0	..	885 10 2	1,822 12 11	11,950 15 4
1928–29	3,049 6 0	4,946 9 8	1 5 0	935 8 0	..	789 0 0	1,796 8 2	11,518 4 10
1929–30	2,602 5 8	5,366 11 11	1 9 0	929 6 0	..	909 8 4	1,586 8 4	11,396 1 3

Summary of past revenue from North Mangalore Forest Division.

Year. (1)	Timber. (2) RS. A. P.	Fuel. (3) RS. A. P.	Bamboos. (4) RS. A. P.	Grazing. (5) RS. A. P.	Minor forest produce. (6) RS. A. P.	Sandalwood. (7) RS. A. P.	Miscellaneous. (8) RS. A. P.	Total. (9) RS. A. P.
1915–16	16,624 7 3	16,022 3 1	2,129 15 8	4,139 1 0	16,840 15 1	389 12 0	13,696 10 2	69,843 0 3
1916–17	35,407 11 1	20,897 4 7	2,451 9 11	4,013 10 0	5,481 8 11	401 13 5	12,357 2 7	81,010 12 6
1917–18	29,469 0 8	18,605 9 2	1,847 1 6	4,171 2 0	17,613 13 0	756 5 0	19,678 8 5	92,141 7 9
1918–19	33,773 6 8	19,737 1 7	1,738 3 6	3,969 6 0	23,501 1 10	8,743 12 7	9,918 8 9	1,01,381 8 11
1919–20	35,000 6 5	20,899 12 11	1,301 7 7	3,916 11 0	48,718 8 2	1,107 9 7	8,529 10 8	1,19,474 2 4
1920–21	30,717 8 6	25,190 14 9	891 1 0	5,823 0 0	4,629 2 1	1,941 0 6	4,881 13 9	74,074 8 7
1921–22	36,265 1 3	35,271 5 8	991 5 1	5,419 12 0	6,179 14 5	5,606 1 10	6,477 15 8	96,211 7 11
1922–23	43,964 6 2	34,149 15 5	2,368 0 0	5,395 10 0	3,197 8 4	14,508 4 2	8,209 7 3	1,11,793 3 4
1923–24	58,231 10 7	43,611 3 0	4,136 0 0	5,753 14 0	2,445 12 2	2,840 2 0	8,390 8 3	1,25,409 2 0
1924–25	58,960 3 7	31,101 8 3	5,533 2 9	5,867 4 0	10,221 7 3	22,886 4 3	9,229 6 0	1,43,799 4 1
1925–26	50,077 13 3	29,154 9 1	1,198 12 0	5,682 4 0	15,914 8 4	21,954 7 2	8,070 14 2	1,32,053 4 0
1926–27	40,555 0 2	23,582 8 9	119 6 0	5,441 2 0	9,312 15 0	14,044 13 9	10,001 11 10	1,03,057 9 6
1927–28	52,583 9 3	27,428 14 2	52 8 0	5,426 14 0	11,442 15 1	5,987 13 1	7,885 2 5	1,10,807 12 0
1928–29	49,794 4 0	22,829 14 2	21 2 0	5,469 6 0	10,772 7 7	1,772 3 8	10,134 7 3	1,00,793 12 8
1929–30	51,096 14 3	23,521 13 1	23 9 0	5,502 8 0	9,959 14 1	2,373 14 7	10,438 14 3	1,02,917 7 3
Total ..	**6,22,521 7 1**	**3,92,004 9 8**	**24,803 4 0**	**75,991 8 0**	**1,96,232 7 4**	**1,05,314 5 7**	**1,47,900 15 3**	**15,64,768 7 1**
Average per annum ..	**41,500**	**26,130**	**1,350**	**5,070**	**13,080**	**7,020**	**9,860**	**1,04,320**

Summary of past expenditure in each range of North Mangalore Forest Division.

Year.	Cost of conservancy and exploitation.				Cost of works.				Land acquisition.	Miscellaneous.	Cost of establishment and allowances.		Total.
	Timber exploitation.	Regeneration.	Fire protection.	Live stock.	Roads and bridges.	Buildings.	Wells and other works.	Demarcation.			Pay and allowances.	Contingencies.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
						COONDAPOOR RANGE.							
1915–16	537 13 3	34 6 0	602 5 5	313 13 8	200 0 4	964 10 8	2 12 0	49 13 6	..	3,800 15 4	7,666 0 11	493 6 11	14,666 2 0
1916–17	885 4 4	..	603 9 1	..	805 7 2	160 7 10	8 12 6	..	..	4,628 0 10	8,620 6 0	1,057 15 6	16,769 15 3
1917–18	1,529 5 4	..	725 14 5	..	32 0 0	262 8 0	..	162 4 5	..	5,282 14 5	7,103 10 8	1,021 13 3	16,120 6 6
1918–19	2,854 9 0	10 0 0	737 9 4	..	1,478 9 9	2,105 1 11	27 0 0	14 15 0	..	5,239 1 11	8,308 5 6	1,510 14 8	22,286 3 1
1919–20	3,403 0 5	3 12 0	582 3 6	..	2,539 8 0	393 5 11	307 4 10	27 3 0	36 3 6	4,577 1 11	7,465 13 10	1,801 11 6	21,137 4 5
1920–21	3,681 5 1	15 3 9	937 11 3	..	731 2 1	1,871 10 2	..	22 13 0	..	1,694 5 1	10,124 5 3	911 10 9	19,990 2 5
1921–22	2,816 2 11	19 11 0	1,468 0 11	..	926 13 0	2,714 2 5	91 4 3	..	..	1,705 12 1	14,854 12 7	682 12 2	25,279 7 4
1922–23	3,144 12 6	136 11 7	1,164 8 5	..	663 15 5	1,250 10 1	84 12 0	..	..	1,849 6 6	16,044 2 9	534 11 4	24,873 10 7
1923–24	10,893 14 0	337 2 2	660 2 3	1,119 4 1	1,252 9 0	2,876 15 5	252 5 5	27 15 0	..	962 12 0	14,272 3 3	457 11 7	33,112 14 2
1924–25	6,252 8 11	121 8 0	641 4 8	1,658 11 4	1,941 10 11	296 13 11	445 11 7	..	..	3,228 10 0	15,010 0 8	454 14 7	30.051 14 7
1925–26	7,797 3 9	23 14 0	800 10 0	1,345 6 8	2,188 14 6	2,688 14 11	1,202 13 11	..	..	3,192 14 6	14,870 9 11	654 11 5	34,766 1 7
1926–27	5,611 3 0	448 15 0	1,022 12 0	4,399 6 11	855 10 0	2,008 1 9	356 0 0	..	..	2,071 7 9	18,038 11 6	546 6 0	35,328 9 11
1927–28	4,890 5 8	732 14 0	1,020 0 0	2,699 12 1	572 2 0	433 2 0	402 5 0	..	..	2,553 8 10	21,333 5 0	764 9 9	35,402 0 4
1928–29	6,297 9 7	709 13 0	744 9 0	2,202 2 8	454 7 0	587 2 0	41 12 0	..	..	1,688 8 0	16,720 6 0	569 8 6	30,015 13 9
1929–30	1,106 10 6	783 14 0	761 12 0	1,116 5 0	274 11 0	669 6 6	77 9 0	30 0 0	..	1,214 6 1	13,865 12 10	488 3 7	20,388 10 6
					SHANKARANARAYANA RANGE.								
1915–16	..	..	385 5 8	7 13 4	99 9 5	320 10 4	..	49 8 0	..	1,159 1 8	3,921 0 8	372 2 0	6,315 3 1
1916–17	64 3 3	..	334 6 3	..	16 14 6	11 4 0	..	52 3 3	..	2,099 1 2	4,476 3 3	665 7 9	7,719 11 5
1917–18	40 4 8	..	361 4 0	..	39 8 0	14 7 4	..	115 12 0	..	1,807 8 8	4,441 7 2	739 1 3	7,559 5 1
1918–19	96 12 10	3 8 0	371 12 0	..	62 11 6	13 4 0	..	164 7 7	763 4 3	2,305 5 3	4,708 14 2	1,067 7 11	9,557 7 6
1919–20	35 12 6	27 4 6	369 7 3	..	279 13 0	15 0 0	..	2 10 0	..	2,657 10 10	4,660 10 6	1,182 7 11	9.230 12 6
1920–21	57 3 8	90 2 0	645 8 6	..	1,092 11 10	212 4 6	..	28 12 0	..	752 6 9	6,818 7 9	769 11 4	10,467 4 4
1921–22	..	59 0 0	811 15 4	..	505 2 6	2,154 2 5	35 7 0	..	..	847 11 1	11,000 11 0	772 15 6	16,187 0 10
1922–23	3 4 0	444 10 3	497 14 5	..	1,003 2 8	520 1 1	6 3 3	..	..	469 15 3	11,150 11 9	514 7 6	14,610 6 2
1923–24	33 6 8	11 1 7	511 5 0	..	105 6 4	1,366 4 4	572 12 3	..	..	412 2 5	8,128 7 0	398 14 0	11,539 11 7
1924–25	698 10 11	21 6 0	506 9 11	217 7 0	167 0 0	296 0 0	..	..	..	586 10 10	8,712 14 0	388 15 8	11,595 10 10
1925–26	1,759 13 0	..	518 1 0	462 12 6	12 0 0	1,436 2 0	32 13 0	..	..	1,025 4 4	8,693 4 8	282 3 2	14,222 5 8
1926–27	2,622 2 0	51 14 0	618 6 0	524 3 7	41 2 6	966 4 7	215 14 9	..	..	917 5 10	9,436 13 10	270 7 8	15,664 10 9
1927–28	2,589 10 8	..	544 3 10	629 6 0	92 2 0	117 12 0	322 8 0	..	..	545 8 2	10,436 14 6	375 9 0	15,653 10 2
1928–29	3,138 15 1	..	513 12 8	391 4 0	185 6 0	1,846 8 0	39 4 0	..	..	605 9 6	8,995 15 0	291 5 3	16,007 15 6
1929–30	829 12 0	..	492 14 0	412 15 0	69 2 0	596 12 0	297 15 0	..	..	624 0 1	8,494 6 5	175 10 2	11,993 6 8
					UDIPI RANGE.								
1915–16	..	..	563 15 4	7 13 4	7 9 5	423 11 2	10 0 0	14 6 0	..	1,442 11 2	5,655 5 1	424 11 9	8,550 3 3
1916–17	11 1 0	..	517 2 6	..	896 0 4	1,184 8 2	40 9 0	101 15 6	..	1,307 12 7	5,821 14 0	805 11 2	10,686 10 3
1917–18	79 11 0	..	480 4 5	..	517 10 1	968 5 7	..	59 15 8	..	1,587 14 4	5,247 6 2	808 11 9	9,749 15 0
1918–19	78 6 0	6 2 0	426 11 1	..	30 0 0	707 12 8	474 2 10	7 8 0	..	1,905 5 9	6,211 14 6	1,342 5 4	11,200 4 2
1919–20	164 12 11	249 2 6	430 6 3	..	157 0 11	134 3 4	510 14 6	284 2 9	..	1,908 3 3	7,168 15 8	1,683 1 9	12,690 15 10
1920–21	1,184 8 0	945 2 10	880 2 2	..	8 7 0	80 1 6	87 1 1	..	..	1,215 11 7	8,970 11 11	832 14 4	14,204 12 5
1921–22	1,727 11 4	1,800 6 1	880 15 6	..	..	1,712 14 9	105 4 8	..	..	1,111 9 6	14,480 3 11	601 15 10	22,421 1 7
1922–23	1,203 9 0	4,346 0 8	697 11 4	..	114 10 6	230 7 1	2,467 15 4	..	..	1,648 7 3	17,275 15 0	629 8 6	28,614 4 8
1923–24	9,984 15 10	2,575 1 5	478 12 7	1,467 10 9	115 0 0	2,612 9 11	..	..	..	742 2 4	15,075 8 0	469 8 6	33,521 5 1
1924–25	7,885 4 5	2,192 15 6	531 0 9	2,450 10 8	..	3,962 7 8	287 11 9	..	..	531 13 4	14,566 10 3	509 8 9	32,918 3 1
1925–26	12,476 2 1	1,828 14 6	504 9 6	2,929 14 0	596 11 0	188 2 0	..	4 0 0	..	772 10 0	17,368 7 8	584 9 0	37,253 15 9
1926–27	16,065 4 11	3,662 13 0	653 13 0	1,901 9 6	497 12 0	708 13 0	..	..	..	570 9 0	18,636 2 10	457 6 6	43,154 3 9
1927–28	14,933 10 1	3,284 6 0	596 13 0	1,509 11 6	241 8 0	1,592 1 0	45 0 0	250 0 0	..	1,014 3 0	19,560 6 9	576 1 10	43,603 13 2
1928–29	14,357 14 6	1,982 11 0	720 8 0	2,546 7 0	224 6 0	1,794 5 0	65 4 6	229 8 0	..	1,135 1 0	18,435 15 0	853 15 7	42,345 15 7
1929–30	17,071 9 8	2,546 7 0	599 14 0	2,735 14 1	426 12 0	2,58[illegible] 10 6	415 3 0	..	..	2,291 3 10	23,910 8 10	1,536 5 11	54,120 8 10

Summary of past expenditure in each range of North Mangalore Forest Division—cont.

Year. (1)	Cost of conservancy and exploitation. Timber exploitation. (2)	Regeneration. (3)	Fire protection. (4)	Live-stock. (5)	Cost of works. Roads and bridges. (6)	Buildings. (7)	Wells and other works. (8)	Demarcation. (9)	Land acquisition. (10)	Miscellaneous. (11)	Cost of establishment and allowances. Pay and allowances. (12)	Contingencies. (13)	Total. (14)
MANGALORE RANGE.													
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
1915-16	97 5 3	..	342 10 0	208 9 1	7 9 5	2,368 8 5	43 10 7	..	..	1,252 7 8	4,688 1 11	476 10 7	9,485 8 11
1916-17	83 8 6	31 8 6	358 0 5	..	10 0 0	385 15 3	328 1 10	232 8 11	..	656 3 5	4,910 15 8	695 6 6	7,692 5 0
1917-18	84 0 0	4 7 0	221 4 0	..	..	44 9 0	54 8 0	134 11 0	..	7,514 3 0	4,926 6 4	778 8 1	13,762 8 5
1918-19	110 8 0	102 7 0	213 6 0	..	..	204 2 9	10 0 3	..	..	31,609 4 8	5,888 8 0	1,268 12 1	39,407 0 9
1919-20	71 4 0	234 13 5	193 7 6	..	6 14 0	152 11 7	2 8 0	4 0 0	..	18,578 11 10	6,929 10 3	1,497 7 1	27,671 7 8
1920-21	22 12 0	266 8 9	391 11 0	..	6 2 0	27 4 10	..	..	..	491 12 7	7,030 0 2	743 7 6	8,979 10 10
1921-22	55 0 0	215 10 6	347 2 0	..	..	101 9 8	..	..	..	361 0 2	10,082 1 0	630 15 8	11,793 7 0
1922-23	..	283 6 6	305 10 6	..	..	85 15 6	6 3 0	..	..	863 11 3	11,664 12 8	508 1 8	13,717 13 1
1923-24	..	10 0 1	242 11 0	119 5 7	74 13 7	2,801 10 4	158 5 0	..	..	297 12 9	9,081 7 0	414 8 6	13,200 9 10
1924-25	..	40 15 0	264 8 0	4 7 2	136 9 11	54 4 0	205 2 7	..	..	907 2 7	9,462 0 8	420 0 8	11,495 2 7
1925-26	..	..	294 9 0	..	26 11 0	77 2 1	..	30 0 0	..	594 1 6	11,203 3 9	212 9 6	12,438 4 10
1926-27	..	137 6 0	349 6 0	..	..	903 0 0	..	..	..	758 6 0	13,104 12 10	340 15 2	15,593 14 0
1927-28	..	56 7 0	348 8 0	..	..	208 1 0	12 0 0	..	..	400 0 0	12,481 0 9	445 2 8	13,951 3 5
1928-29	..	..	352 14 0	..	..	556 10 0	73 6 0	..	..	373 6 8	7,352 2 0	62 6 5	8,770 13 1
1929-30	..	..	292 14 0	3 15 6	..	1,104 12 6	4 4 0	..	..	311 2 3	7,284 9 11	107 6 10	9,109 1 0

Summary of past expenditure in North Mangalore Forest Division.

Year. (1)	Cost of conservancy and exploitation. Timber extraction. (2)	Regeneration. (3)	Fire protection. (4)	Live stock. (5)	Cost of works. Roads and bridges. (6)	Buildings. (7)	Wells and other works. (8)	Demarcation. (9)	Land acquisition. (10)	Miscellaneous. (11)	Pay and allowances. (12)	Contingencies. (13)	Total. (14)
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	Rs. A. P.	RS. A. P.	RS. A. P
1915-16	635 2 6	34 6 0	1,894 4 5	538 1 5	314 12 7	4,077 8 7	56 6 7	113 11 6	..	7,655 3 10	21,930 8 7	1,766 15 3	39,017 1 3
1916-17	1,044 1 1	31 8 6	1,813 2 3	..	1,728 6 0	1,742 3 3	377 7 4	386 11 8	..	8,691 2 0	23,829 6 11	3,224 8 11	42,868 9 11
1917-18	1,733 5 0	4 7 0	1,788 10 10	..	589 2 1	1,289 13 11	54 8 0	472 11 1	..	16,192 8 5	21,718 14 4	3,348 2 4	47,192 3 0
1918-19	3,140 3 10	122 1 0	1,749 6 5	..	1,571 5 3	3,030 5 4	511 3 1	196 14 7	763 4 3	41,059 1 7	25,117 10 2	5,189 8 0	82,450 15 6
1919-20	3,674 13 10	515 0 5	1,575 8 6	..	2,983 3 11	695 4 10	820 11 4	317 15 9	36 3 6	27,721 11 10	26,225 2 3	6,164 12 3	70,730 8 5
1920-21	4,945 12 9	1,317 1 4	2,855 0 11	..	1,838 6 11	2,191 5 0	87 1 1	51 9 0	..	4,154 4 0	32,943 9 1	3,257 11 11	53,641 14 0
1921-22	4,598 14 3	2,094 11 7	3,508 1 9	..	1,431 15 6	6,682 13 3	231 15 11	..	..	4,026 0 10	50,417 12 6	2,688 11 2	75,681 0 9
1922-23	4,351 9 6	5,210 13 0	2,665 12 8	..	1,781 12 7	2,087 1 9	2,565 1 7	..	..	4,831 8 3	56,135 10 2	2,186 13 0	81,816 2 6
1923-24	20,912 4 6	2,933 5 3	1,892 14 10	2,706 4 5	1,547 12 11	9,657 8 0	983 6 8	27 15 0	..	2,414 13 6	46,557 9 3	1,740 10 4	91,374 8 8
1924-25	14,836 8 3	2,376 12 6	1,943 7 4	4,331 4 2	2,245 4 10	4,609 10 1	938 9 11	..	..	5,254 4 9	47,751 9 7	1,773 7 8	86,060 15 1
1925-26	22,033 2 10	1,852 12 6	2,117 13 6	4,738 1 2	2,824 4 6	4,390 5 0	1,235 10 11	34 0 0	..	5,584 14 4	52,135 10 0	1,734 1 1	98,680 11 10
1926-27	24,298 9 11	4,301 0 0	2,644 5 0	6,825 4 0	1,394 8 6	4,586 3 4	571 14 9	..	..	4,317 12 7	59,216 9 0	1,585 3 4	1,09,741 6 5
1927-28	22,413 10 5	4,073 11 0	2,509 8 10	4,838 13 7	905 12 0	2,351 0 0	781 13 0	250 0 0	..	4,513 4 0	63,811 11 0	2,161 7 3	1,08,610 11 1
1928-29	23,794 7 2	2,692 8 0	2,331 11 8	5,139 13 8	864 3 0	4,784 9 0	219 10 6	229 8 0	..	3,802 9 2	51,504 6 0	1,777 3 9	97,140 9 11
1929-30	19,008 0 2	3,330 5 0	2,147 6 0	4,269 1 7	770 9 0	4,957 9 6	794 15 0	30 0 0	..	4,440 12 3	53,555 6 0	2,307 10 6	95,611 11 0
Total ..	1,71,420 10 0	30,890 7 1	33,437 2 11	33.386 12 0	22,791 7 7	57,133 4 10	10,230 7 8	2,111 0 7	799 7 9	1,44,659 15 4	6,32,351 6 10	40,906 14 0	11,80,619 1 4
Average per annum .	11,430	2,060	2,230	2,230	1,520	3 810	68-	1.0	50	9,640	42,190	2,730	78,710

Financial position of North Mangalore Division during the last fifteen years.

Year.	Revenue.	Expenditure.	Surplus.	Deficit.
(1)	(2)	(3)	(4)	(5)
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
1915–16	69,843 0 3	39,017 1 3	30,825 15 0	..
1916–17	81,010 12 6	42,868 9 11	38,142 2 7	..
1917–18	92,141 7 9	47,192 3 0	44,949 4 9	..
1918–19	1,01,381 8 11	82,450 15 6	18,930 9 5	..
1919–20	1,19,474 2 4	70,730 8 5	48,743 9 11	..
1920–21	74,074 8 7	53,641 14 0	20,432 10 7	..
1921–22	96,211 7 11	75,681 0 9	20,530 7 2	..
1922–23	1,11,793 3 4	81,816 2 6	29,977 0 10	..
1923–24	1,25,409 2 0	91,374 8 8	34,034 9 4	..
1924–25	1,43,799 4 1	86,060 15 1	57,738 5 0	
1925–26	1,32,053 4 0	98,680 11 10	33,372 8 2	..
1926–27	1,03,057 9 6	1,09,741 6 5	..	6,683 12 11
1927–28	1,10,807 12 0	1,08,610 11 1	2,197 0 11	..
1928–29	1,00,793 12 8	97,140 9 11	3,653 2 9	..
1929–30	1,02,917 7 3	95,611 11 0	7,305 12 3	..

CHAPTER VI.—STATISTICS OF GROWTH AND YIELD.

SECTION 1.—STATISTICS COLLECTED PRIOR TO THE PREPARATION OF THIS WORKING PLAN.

278. The following statistics were collected regarding the percentage of yield of sandal oil from its heartwood :—

In 1914 one sandal tree, 23 inches in girth, grown in an open, lateritic scrub jungle was uprooted and the weight of scented wood obtained after cleaning was 4 quarters and 10 tolas. The age of the tree was estimated at 50 to 60 years determined by ring countings, and the diameter of the heartwood at the base was $4\frac{1}{2}$ inches. On analysis it was determined that the stemwood contained 8·8 per cent and the roots 9·8 per cent of oil by weight of the heartwood used in distillation.

279. In 1915 eleven sandalwood specimens collected from different localities of the division and grown under varying conditions of soil, elevation, and overhead cover were sent to the Forest Chemist at Dehra Dun for analysing the oil content of the wood specimens. The results are tabulated in the following statement :—

Analysis of sandalwood specimens.

	Range.	Locality.	Elevation.	Soil.	Growth.	Rainfall in inches.	Girth at 4′ 6″ height in inches.	Weight of tree with bark.			Weight of heartwood.			Specimens. Description.	Specimens. Weight.			Percentage of sandal oil to dry materials.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)			(9)			(10)	(11)			(12)
								QRS.	LB.	TOL.	QRS.	LB.	TOL.		QRS.	LB.	TOL.	
1	Uppinangadi	Kankrady S. No. 230.	150	Clay loam.	Ever-green.	..	13	1	15	16	1	8	0	Billet ..	0	1	13	7·81
														Roots ..	0	1	11	4·98
2	Puttur ..	Shantigody S. No. 1141	290	Laterite.	Scrub.	145	18	4	25	0	1	15	30	Billet ..	0	2	37	8·35
														Roots ..	0	2	20	9·03
3	Do. ..	Shantigody S. No. 132.	390	Do.	Do.	146	17	3	17	20	1	13	20	Billet ..	0	4	3	8·44
														Roots ..	0	2	31	9·40
4	Do. ..	Shantigody S. No. 151.	590	Do.	Do.	145	18	4	23	0	1	17	30	Billet ..	0	3	14	7·07
														Roots ..	0	3	14	6·70
5	Kasaragod ..	Nidpally S. No. 43 ..	300	Do.	Do.	130	27	19	1	0	7	3	10	Billet ..	0	4	0	8·65
														Roots ..	0	5	35	7·90
6	Do. ..	Adur S. No. 50 ..	300	Do.	Do.	130	26	19	2	20	6	6	30	Billet ..	0	2	21	7·71
														Roots ..	0	3	24	7·63
7	Do. ..	Nidpally S. No. 43 ..	450	Do.	Do.	130	$21\frac{1}{2}$	13	4	0	2	26	20	Billet ..	0	2	28	6·90
														Roots ..	0	3	19	6·69
8	Mangalore ..	Tenkamijar S. No. 86.	500	Do.	Do.	145	19	5	14	0	1	2	0	Billet ..	0	2	21	7·56
														Roots ..	0	4	25	7·77
9	Do. ..	Madagamijar S. No. 114.	600	Do.	Do.	145	19	5	20	0	1	22	0	Billet ..	0	1	33	8·36
														Roots ..	0	1	20	10·97
10	Do. ..	Puttige	650	Do.	Do.	145	20	6	26	0	2	18	0	Billet ..	0	5	0	7·88
														Roots ..	0	6	18	7·74
11	Udipi ..	Vorwady Reserved Forest.	200	Do.	Do.	175	25	13	7	0	3	4	0	Billet ..	0	2	32	8·49
														Roots ..	0	5	7	9·40

The remarks of the Forest Chemist, in forwarding the results of his analysis, are worth recording—

" The South Kanara sandal samples are uniformly richer in oil than any other samples I have examined till now. I must therefore say that the opinion held till now as to the valuelessness of South Kanara sandalwood for want of oil is absolutely unfounded ".

280. During the preparation of the working plan by Mr. G. S. Lazarado for the *Acacia, sundra* areas of Coondapoor Range, sanctioned in Chief Conservator's Proceedings No. 150,

dated 15th June 1925, ring countings were made on 675 felled *Acacia* trees. The results indicate that it takes twenty-eight years for the species to attain a girth of 24 inches. A statement showing the girth and the number of rings counted is given below :—

Statement showing the girth and number of rings of catechu trees felled in Baindur Block during the year 1923–24.

Serial number.	Girth inches.	Number of rings.	Serial number.	Girth inches.	Number of rings.	Serial number.	Girth inches.	Number of rings.	Serial number.	Girth inches.	Number of rings.
1	26	25	85	28	29	169	24	20	253	24	19
2	24	19	86	30	32	170	24	14	254	24	15
3	26	26	87	27	28	171	24	17	255	24	19
4	24	19	88	27	26	172	24	15	256	24	20
5	24	22	89	25	24	173	24	14	257	26	24
6	25	23	90	24	23	174	25	24	258	24	21
7	26	25	91	26	25	175	25	23	259	24	17
8	27	25	92	28	30	176	24	19	260	24	21
9	27	25	93	24	19	177	24	15	261	25	22
10	28	27	94	25	25	178	24	18	262	26	26
11	30	29	95	30	31	179	24	21	263	26	25
12	24	23	96	24	19	180	24	29	264	24	20
13	25	26	97	25	23	181	24	14	265	25	23
14	25	23	98	24	18	182	24	18	266	24	19
15	24	23	99	26	25	183	24	18	267	26	25
16	27	27	100	24	19	184	24	17	268	27	29
17	27	27	101	24	19	185	24	16	269	24	20
18	26	26	102	24	23	186	24	15	270	26	25
19	25	24	103	24	22	187	24	22	271	25	24
20	29	28	104	25	23	188	25	22	272	26	27
21	25	24	105	24	22	189	24	20	273	26	25
22	27	25	106	24	18	190	24	18	274	25	23
23	28	27	107	24	22	191	24	18	275	26	23
24	29	28	108	26	24	192	24	19	276	26	26
25	24	19	109	21	22	193	27	27	277	27	27
26	25	25	110	24	21	194	25	22	278	27	26
27	24	19	111	24	23	195	25	23	279	36	34
28	25	24	112	24	20	196	25	24	280	25	23
29	24	22	113	24	22	197	25	23	281	25	24
30	30	31	114	25	23	198	24	21	282	24	16
31	29	28	115	24	21	199	24	19	283	20	26
32	32	33	116	26	24	200	24	15	284	24	21
33	27	27	117	24	22	201	24	15	285	26	24
34	26	26	118	26	25	202	24	18	286	25	22
35	29	29	119	25	23	203	24	19	287	25	23
36	28	27	120	26	24	204	24	19	288	24	21
37	25	24	121	24	20	205	25	23	289	24	19
38	26	26	122	24	21	206	26	27	290	24	19
39	24	22	123	24	19	207	24	20	291	24	19
40	24	21	124	24	19	208	25	24	292	25	22
41	25	24	125	24	22	209	24	15	293	30	29
42	24	23	126	25	23	210	26	25	294	24	20
43	26	25	127	26	24	211	25	24	295	24	21
44	29	29	128	27	29	212	26	26	296	24	19
45	25	24	129	26	25	213	27	28	297	24	19
46	26	25	130	24	21	214	24	20	298	25	23
47	27	26	131	24	2	215	25	22	299	25	22
48	25	23	132	27	28	216	24	21	300	24	20
49	27	28	133	26	27	217	24	15	301	24	17
50	32	30	134	24	20	218	28	29	302	24	21
51	26	26	135	26	23	219	24	20	303	24	19
52	25	24	136	28	29	220	25	22	304	25	22
53	24	24	137	24	19	221	25	22	305	24	21
54	24	19	138	24	21	222	24	21	306	28	28
55	26	25	139	24	20	223	25	24	307	24	19
56	31	32	140	24	22	224	25	24	308	24	21
57	26	25	141	24	22	225	24	16	309	26	25
58	25	24	142	24	19	226	24	19	310	24	20
59	26	26	143	24	19	227	25	24	311	29	28
60	24	19	144	24	16	228	25	23	312	26	24
61	24	23	145	24	14	229	26	25	313	24	2
62	24	25	146	24	14	230	25	22	314	24	20
63	28	29	147	26	24	231	25	22	315	25	22
64	25	26	148	24	14	232	28	28	316	26	24
65	25	25	149	24	14	233	24	19	317	24	18
66	24	20	150	24	15	234	25	24	318	24	19
67	29	29	151	25	24	235	26	25	319	24	21
68	30	31	152	26	24	236	28	29	320	24	19
69	24	21	153	24	18	237	24	20	321	26	25
70	28	26	154	24	14	238	24	18	322	24	20
71	24	23	155	24	19	239	24	19	323	25	23
72	24	20	156	24	15	240	24	21	324	24	19
73	24	21	157	24	16	241	24	16	325	25	23
74	27	27	158	24	19	242	24	19	326	31	32
75	24	24	159	24	19	243	25	21	327	28	27
76	29	30	160	24	14	244	24	17	328	28	28
77	25	25	161	26	26	245	26	24	329	26	24
78	25	24	162	24	17	246	25	25	330	26	25
79	32	32	163	24	15	247	26	25	331	27	28
80	25	25	164	24	19	248	25	24	332	25	24
81	24	21	165	24	16	249	25	22	333	25	24
82	28	28	166	24	22	250	24	18	334	29	28
83	25	24	167	24	20	251	24	17	335	29	22
84	24	21	168	24	15	252	24	18	336	25	70

Statement showing the girth and number of rings of catechu trees felled in Baindur Block during the year 1923–24—cont.

Serial number.	Girth inches.	Number of rings.	Serial number.	Girth inches.	Number of rings.	Serial number.	Girth inches.	Number of rings.	Serial number.	Girth inches.	Number of rings.
337	25	24	422	26	25	507	24	18	592	26	24
338	24	19	423	28	27	508	26	22	593	31	32
339	24	21	424	27	26	509	29	27	594	33	36
340	24	20	425	28	29	510	26	24	595	30	30
341	26	24	426	36	35	511	25	22	596	36	37
342	24	19	427	27	25	512	26	26	597	26	23
343	24	16	428	27	26	513	27	26	598	26	26
344	26	24	429	25	23	514	26	25	599	27	29
345	34	32	430	26	25	515	34	32	600	27	27
346	24	21	431	25	23	516	29	27	601	32	31
347	26	24	432	27	27	517	25	22	602	28	29
348	24	19	433	26	24	518	24	19	603	28	29
349	24	18	434	27	26	519	30	28	604	28	27
350	28	26	435	24	20	520	27	26	605	31	32
351	26	25	436	27	26	521	24	24	606	30	31
352	26	26	437	24	30	522	25	23	607	35	33
353	25	22	438	26	25	523	28	28	608	36	35
354	24	19	439	29	27	524	26	24	609	32	31
355	24	19	440	24	18	525	26	25	610	35	37
356	25	23	441	24	21	526	28	27	611	43	38
357	24	21	442	25	22	527	32	34	612	29	30
358	24	20	443	25	22	528	31	33	613	31	31
359	27	25	444	27	26	529	30	32	614	40	40
360	26	24	445	29	30	530	33	35	615	52	42
361	24	18	446	24	19	531	31	32	616	29	28
362	26	25	447	26	25	532	35	33	617	35	33
363	24	21	448	24	19	533	30	32	618	31	31
364	25	22	449	25	23	534	43	40	619	35	36
365	27	26	450	27	26	535	28	28	620	32	33
366	25	22	451	30	31	536	32	34	621	36	35
367	25	22	452	29	28	537	27	28	622	30	31
368	24	21	453	27	26	538	36	35	623	39	38
369	24	20	454	28	28	539	33	32	624	29	29
370	27	25	455	24	18	540	36	36	625	31	31
371	27	26	456	25	22	541	28	29	626	36	35
372	30	29	457	24	22	542	30	31	627	42	40
373	32	30	458	24	20	543	25	24	628	31	32
374	24	18	459	26	26	544	27	27	629	30	29
375	25	23	460	24	21	545	27	28	630	31	38
376	26	24	461	26	24	546	28	29	631	30	31
377	32	31	462	29	28	547	29	30	632	31	32
378	24	18	463	25	23	548	37	36	633	35	36
379	25	22	464	24	21	549	27	29	634	30	30
380	26	24	465	25	22	550	27	28	635	37	36
381	30	31	466	26	25	551	31	31	636	31	32
382	30	31	467	26	26	552	29	30	637	30	29
383	26	24	468	34	33	553	38	36	638	44	43
384	24	20	469	26	24	554	28	28	639	42	41
385	26	24	470	26	25	555	27	28	640	38	37
386	30	29	471	36	35	556	29	31	641	37	39
387	27	26	472	29	30	557	27	28	642	30	29
388	27	27	473	24	21	558	38	36	643	39	38
389	26	24	474	27	26	559	32	32	644	34	32
390	28	29	475	24	21	560	27	28	645	26	25
391	28	27	476	25	23	561	29	30	646	30	30
392	25	23	477	28	27	562	30	31	647	32	31
393	25	22	478	25	23	563	28	29	648	30	31
394	29	27	479	24	19	564	32	31	649	33	33
395	26	24	480	25	22	565	32	32	650	34	35
396	24	19	481	24	20	566	25	23	651	48	42
397	26	24	482	28	28	567	32	32	652	38	37
398	25	24	483	26	24	568	36	37	653	38	39
399	24	21	484	30	31	569	28	28	654	46	43
400	25	23	485	24	21	570	34	33	655	29	29
401	24	21	486	34	32	571	35	34	656	29	28
402	24	19	487	24	19	572	32	32	657	34	32
403	25	23	488	24	18	573	28	29	658	39	39
404	26	25	489	27	26	574	29	29	659	32	31
405	27	26	490	25	22	575	33	33	660	28	29
406	27	25	491	32	31	576	32	34	661	36	35
407	27	26	492	26	24	577	39	38	662	33	32
408	26	24	493	24	19	578	28	28	663	28	29
409	25	22	494	25	22	579	31	30	664	28	28
410	24	19	495	24	20	580	32	33	665	27	26
411	25	23	496	24	18	581	28	28	666	28	29
412	27	26	497	24	21	582	38	38	667	32	31
413	29	28	498	26	24	583	34	34	668	30	29
414	27	25	499	25	24	584	28	27	669	28	28
415	24	19	500	24	21	585	33	35	670	32	31
416	24	20	501	24	19	586	33	35	671	28	27
417	24	21	502	25	23	587	34	36	672	32	33
418	30	29	503	29	27	588	27	28	673	28	26
419	27	26	504	25	23	589	31	32	674	27	25
420	24	21	505	24	21	590	25	22	675	33	31
421	25	23	506	24	20	591	31	32			

Ring counting of catechu.

Number.	Girth of section.	Mean radius.	Ring counting. Radius in inches.	Number of rings.	Radius in inches.	Number of rings.	Radius in inches.	Number of rings.	Radius in inches.	Number of rings.	Radius in inches.	Number of rings.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	FT.	IN.	IN.		IN.		IN.		IN.		IN.		
1 ..	3	5-7/10	1	3	2	5	3	3	4	9	5	11	½ inch sapwood and 1/5 inch bark.
2 ..	2½	5-1/10	1	7	3	9	4	9	4-3/10	3	..	..	½ inch sapwood and 1/5 inch bark.
3 ..	2	3-9/10	1	7	2	8	3	10	..	..	..	..	3/5 inch sapwood and 3/10 inch bark.
..	1½	3	1	4	2	7	2-1/5	2	..	..	..	..	3/5 inch sapwood and 1/5 inch bark.
5 ..	1	2	1	6	..	..	..	..	..	..	..	..	

281. Mr. Mahammad Habibulla Sahib, the District Forest Officer, North Mangalore, when revising the fuel working plan of Coondapoor Range in 1930, collected statistics regarding the rate of growth of coppice shoots of various species in felled coupes, in order to determine the rotation. The results are tabulated below. On an average forty years are required for coppice shoots in fuel coupes to attain a girth of 24 inches.

Reserve.	Coupe number.	Year of felling.	Age of coppice.	Total number of shoots measured.	Total girth in inches.	Average girth.	Mean annual girth increment.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1 Sarpanamane ..	I	1897–98 ..	32	1,157	13,797	11·93	·37
2 Karnigudde ..	I	1897–98 ..	32	496	8,677	17·49	·55
3 Do. ..	VI	1900–01 ..	29	976	15,529	15·91	·55
4 Korakoppa ..	I	1903–04 ..	26	467	5,069	10·85	·42
5 Abbigudde ..	I	1911–12 ..	18	544	6,024	11·07	·62
6 Nujinane	I	1911–12 ..	18	435	3,392	7·79	·43
7 Herur	I	1911–12 ..	18	764	5,756	7·53	·42
8 Korakoppa ..	VI	1912–13 ..	17	266	2,869	10·79	·64
9 Guruvanacote ..	I	1916–17 ..	13	557	6,730	12·08	·93
10 Baindur	II	1917–18 ..	12	598	4,150	6·94	·58
11 Kursegudde ..	III	1919–20 ..	10	603	6,669	11·06	1·11

$$\text{Average mean annual girth increment} = \frac{6 \cdot 62}{11} = \cdot 6 \text{ of an inch.}$$

282. Parts of Someshwar and Andar Reserves were surveyed topographically and cruised by the 'Logging Branch' between the years 1925 and 1928. All cruise sheets and cover maps connected with their work in this division are recorded separately in the office of the Conservator of Forests, III Working Plans Circle.

SECTION 2.—STATISTICS COLLECTED DURING THE PREPARATION OF THIS PLAN.

283. *Volume tables.*—Of recent years it has been the practice in the district to record breast height girths of trees marked for felling, approximate length of bole, mean girth and actual length of bole after felling, in Form 3 (Register showing the gross yield of timber fellings by Government agency). This register shows also the final outturn of marketable timber carried to Form 4. With the available data it was considered desirable to prepare volume tables based on breast height girths of trees. Tables were prepared for *Hopea parviflora*, *Terminalia paniculata*, *Terminalia tomentosa* and *Lagerstrœmia lanceolata*. The abstract showing the girth class, number of trees, total volume and average volume for each girth class is given below. To these should be added figures collected in succeeding years until enough are available for the preparation of accurate volume tables. These figures must be annually communicated to the Provincial Sylviculturist.

Girth class in inches.	Terminalia paniculata. Number of trees.	Total volume in cubic feet.	Average volume in cubic feet.	Terminalia tomentosa. Number of trees.	Total volume in cubic feet.	Average volume in cubic feet.	Lagerstroemia lanceolata. Number of trees.	Total volume in cubic feet.	Average volume in cubic feet.	Hopea parviflora. Number of trees.	Total volume in cubic feet.	Average volume in cubic feet.
37–42 ..	2	28	14·0	13	205	16·0	..	..	..	20	376	18 8
43–48 ..	60	1,119	18·6	246	4,407	18 0	44	988	22 5	177	4,876	27·5
49–54 ..	189	3,646	19·0	394	8,205	21·0	103	2,578	25·0	381	11,714	30·7
55–60 ..	286	6,501	22 7	458	9,427	20·8	173	4,384	25·3	296	10,847	36·6
61–66 ..	200	5,344	26·7	227	5,141	22 7	129	3,782	29·3	206	9,265	45·0
67–72 ..	163	4,899	30·0	136	3,321	24·4	71	2,237	31·5	135	7,035	52·1
73–78 ..	87	3,032	35·0	66	1,838	28·0	48	1,813	37·8	71	4,283	60·3
79–84 ..	53	2,061	39·0	33	879	26·0	31	1,206	39·0	50	3,935	78·7
85–90 ..	28	1,114	40·0	23	734	31·8	17	740	43·0	31	2,352	76·0
91–96 ..	25	1,229	49·1	16	595	37·2	14	835	59·6	19	1,486	78 2
97–102 ..	25	911	36·5	10	377	37·7	8	460	57·5	6	601	100·0
103–108 ..	8	519	64·9	..	..	..	13	726	55·5	..	..	..

284. Curves were drawn showing the net average volume per tree against the corresponding girth class and vloumes were read off the curves for each girth class. The table given below shows the actual outturn of that portion of the tree which would ordinarily be removed from the forest. The figures represent the volumes of round logs. The outturn figures depend for their accuracy on the number of trees taken for obtaining the average. The figures in italics represent average obtained from more than thirty trees ; the other figures have been obtained from a comparatively smaller number of trees and so should be applied with caution.

Girth at breast height in inches.	Volume in cubic feet of converted timber.			
	Hopea parviflora.	Lagerstroemia lanceolata.	Terminalia tomentosa.	Terminalia paniculata.
36	15	17	15	12
42	*21*	*19*	*17*	*14*
48	*27*	*22*	*18*	*17*
54	*34*	*24*	*20*	*21*
60	*41*	*27*	*22*	*24*
66	*48*	*30*	*24*	*28*
72	*56*	*33*	*26*	*32*
78	*64*	*37*	*28*	*36*
84	*72*	*42*	*31*	*41*
90	*82*	48	34	46
96	93	54	37	51
102	..	61	41	57
08	..	68	45	64

285. The following statement shows the results of enumerations made in the various reserves of the division during the preparation of the plan :—

Statement showing the timber species war enumerations in one foot gradations in the several reserves of North Mangalore Division.

Name of the reserve and the area where enumeration is was carried out and extent.	Botanical name of the species.	Girthwar in one foot gradations. 3 feet to 4 feet. NO.	3 feet to 4 feet. C.FT.	4 feet to 5 feet. NO.	4 feet to 5 feet. C.FT.	5 feet to 6 feet. NO.	5 feet to 6 feet. C.FT.	6 feet to 7 feet. NO.	6 feet to 7 feet. C.FT.	7 feet to 8 feet. NO	7 feet to 8 feet. C.FT.	8 feet to 9 feet. NO.	8 feet to 9 feet. C.FT.	Over 9 feet. NO.	Over 9 feet. C.FT.	Total. NO.	Total. C.FT.
1. MEGANI VALLEY RESERVED FOREST.	Terminalia paniculata ..	44	756	84	2,778	53	2,578	42	3,023	21	2,148	4	407	3	423	251	12,113
	Lagerstrœmia lanceolata.	96	2,098	147	5,930	107	6,858	68	6,191	18	1,969	8	1,196	1	282	445	24,524
	Lagerstrœmia flos reginæ.	..	..	4	120	3	142	..	..	1	88	..	..	..	..	8	350
Area **101·6** acres by the side of Mavinkkarai hole.	Vitex altissima	6	71	13	318	1	38	6	251	1	35	..	..	..	..	27	713
	Dalbergia latifolia ..	3	65	..	..	1	76	..	..	..	..	..	..	..	..	4	141
	Artocarpus lakoocha ..	..	..	4	165	1	66	1	66	..	..	..	..	..	..	6	297
	Total ..	**149**	**2,990**	**252**	**9,311**	**166**	**9,758**	**117**	**9,531**	**41**	**4,240**	**12**	**1,603**	**4**	**705**	**741**	**38,138**
2. MEGANI VALLEY RESERVED FOREST.																	
Enumeration line started from cairn No. 196, length 52 chains, one chain on either side. Area **10·4** acres.	Terminalia paniculata ..	3	38	4	82	3	104	2	132	..	..	2	181	1	56	15	593
	Terminalia tomentosa ..	..	..	1	19	..	..	..	..	..	..	..	..	..	..	1	19
	Lagerstrœmia lanceolata.	3	46	2	38	1	38	2	158	3	246	..	..	..	..	11	526
	Vitex altissima	2	23	..	..	2	47	1	53	1	53	1	68	..	..	7	244
	Adina cordifolia ..	..	..	1	32	..	..	5	317	3	211	2	361	..	..	11	921
	Eugenia operculata ..	..	..	..	..	1	57	..	..	1	70	2	271	..	..	4	398
	Machilus macrantha ..	..	..	1	25	..	..	1	40	..	..	..	..	..	..	2	65
	Total ..	**8**	**107**	**9**	**196**	**7**	**246**	**11**	**700**	**8**	**580**	**7**	**881**	**1**	**56**	**51**	**2,766**
3. MEGANI VALLEY RESERVED FOREST.																	
Enumeration started from cairn No. 2. Sampandue West, length 42 chains, one chain on either side. Area **8·4** acres.	Terminalia paniculata	8	134	8	221	4	151	3	145	3	299	..	..	..	..	26	950
	Lagerstrœmia lanceolata.	9	161	16	499	9	464	7	541	7	624	1	113	..	..	49	2,402
	Lagerstrœmia flos reginæ.	..	..	3	101	1	57	1	53	..	..	..	..	..	..	5	211
	Vitex altissima	..	..	1	13	..	..	..	..	..	..	..	..	..	..	1	13
	Dalbergia latifolia ..	2	31	..	..	..	..	..	..	..	..	..	..	..	..	2	31
	Eugenia operculata ..	..	..	1	25	3	180	1	66	4	369	2	293	..	..	11	933
	Litsæa wightiana ..	1	15	1	25	..	..	..	..	..	..	..	..	..	..	2	40
	Machilus macrantha ..	..	..	..	..	..	..	..	..	1	70	..	..	..	..	1	70
	Total ..	**20**	**341**	**30**	**884**	**17**	**852**	**12**	**805**	**15**	**1,362**	**3**	**406**	..	..	**97**	**4,650**
4. MEGANI VALLEY RESERVED FOREST.																	
Started from cairn No. 109. sixty chains long with one chain on either side. Area **12** acres.	Terminalia paniculata ..	3	46	..	..	6	227	2	106	6	562	1	90	..	..	18	1,031
	Lagerstrœmia lanceolata.	13	230	9	272	8	397	5	370	3	263	4	519	1	169	43	2,220
	Lagerstrœmia flos reginæ.	2	31	..	..	..	..	..	..	..	..	..	..	..	..	2	31
	Vitex altissima	..	..	..	..	1	38	..	..	..	..	..	..	..	..	1	38
	Dalbergia latifolia ..	..	..	1	19	..	..	..	..	..	..	..	..	..	..	1	19
	Albizzia odoratissima ..	1	15	1	38	..	..	..	..	..	..	..	..	..	..	2	53
	Artocarpus lakoocha ..	1	12	..	..	..	..	..	..	..	..	..	..	..	..	1	12
	Machilus macrantha ..	..	..	..	..	..	..	..	..	..	..	1	158	..	..	1	158
	Total ..	**20**	**334**	**11**	**329**	**15**	**662**	**7**	**476**	**9**	**825**	**6**	**767**	**1**	**169**	**69**	**3,562**

Statement showing the timber specieswar enumerations in foot gradations in the several reserves of North Mangalore division—cont.

Name of the reserve and the area where enumeration was carried out and extent.	Botanical name of the species.	Girthwar in one foot gradations. 3 feet to 4 feet. NO.	3 feet to 4 feet. C. FT.	4 feet to 5 feet. NO.	4 feet to 5 feet. C. FT.	5 feet to 6 feet. NO.	5 feet to 6 feet. C. FT.	6 feet to 7 feet. NO.	6 feet to 7 feet. C. FT.	7 feet to 8 feet. NO.	7 feet to 8 feet. C. FT.	8 feet to 9 feet. NO.	8 feet to 9 feet. C. FT.	Over 9 feet. NO.	Over 9 feet. C. FT.	Total. NO.	Total. C. FT.
5. MUDUGALPARE RESERVED FOREST.																	
Started from cairn No. 48, 40 chains long width 1 chain on either side. Area 8 acres.	Terminalia paniculata ..	39	609	26	866	7	425	2	119	3	404	..	..	..	..	77	2,423
	Lagerstrœmia lanceolata.	4	57	1	38	2	132	..	..	..	..	..	..	..	..	7	227
	Terminalia tomentosa ..	1	12	..	..	..	..	..	..	..	..	..	..	..	..	1	12
	Hopea parviflora ..	1	23	..	..	..	..	..	..	..	..	..	..	..	..	1	23
	Dalbergia latifolia ..	3	54	..	..	..	..	..	..	..	..	..	..	..	..	3	54
	Xylia xylocarpa ..	2	27	2	82	2	114	..	..	..	..	..	..	..	..	6	223
	Albizzia odoratissima ..	1	8	..	..	..	..	..	..	..	..	..	..	..	..	1	8
	Artocarpus lakoocha ..	..	..	1	38	1	57	..	..	..	..	..	..	..	..	2	95
	Machilus macrantha ..	..	..	1	44	..	..	..	..	..	..	..	..	..	..	1	44
	Adina cordifolia ..	3	46	..	..	..	..	..	..	..	..	..	..	..	..	3	46
	Litsæa wightiana ..	4	77	..	..	..	..	..	..	..	..	..	..	..	..	4	77
	Eugenia jambolona ..	4	47	..	..	..	..	..	..	..	..	..	..	..	..	4	47
	Total ..	**62**	**960**	**31**	**1,068**	**12**	**728**	**2**	**119**	**3**	**404**	..	..	..	..	**110**	**3,279**
6. BAREGUNDI RESERVED FOREST.																	
Starting from cairn No. 119 with bearing 330° length 42 chains, 1 chain on either side. Area 8·4 acres.	Terminalia paniculata ..	43	665	50	1,390	13	435	11	581	3	238	..	..	1	85	121	3,394
	Lagerstrœmia lanceolata.	48	903	59	1,977	21	993	1	66	3	211	..	..	..	..	132	4,150
	Xylia xylocarpa ..	15	222	2	57	..	..	..	..	..	..	..	..	..	..	17	279
	Albizzia odoratissima ..	..	..	1	25	..	..	..	..	..	..	..	..	..	..	1	25
	Dalbergia latifolia ..	1	12	1	25	1	47	..	..	..	..	..	..	..	..	3	84
	Vitex altissima	..	..	..	..	2	57	1	26	..	..	..	..	..	..	3	83
	Litsæ wightiana ..	3	50	..	..	..	..	..	..	..	..	..	..	..	..	3	50
	Total ..	**110**	**1,852**	**113**	**3,474**	**37**	**1,532**	**13**	**673**	**6**	**449**	..	..	**1**	**85**	**280**	**8,065**
7. BAREGUNDI RESERVED FOREST.																	
Started from cairn No. 127 with bearing 280°. Length 30 chains, width 1 chain on either side. Area 6 acres.	Terminalia paniculata ..	6	84	2	63	3	142	1	66	1	88	2	248	..	..	15	691
	Lagerstrœmia lanceolata.	11	222	4	133	4	218	1	66	4	369	..	..	..	..	24	1,008
	Xylia xylocarpa ..	38	669	3	89	..	..	..	..	..	..	..	..	..	..	41	758
		55	**975**	**9**	**285**	**7**	**360**	**2**	**132**	**5**	**457**	**2**	**243**	..	..	**80**	**2,457**

Statement showing the timber specieswar enumerations in foot gradations in the several reserves of North Mangalore division—cont.

Name of the reserve and the area where enumeration was carried out and extent.	Botanical name of the species.	Girthwar in one foot gradations. 3 feet to 4 feet. NO.	3 feet to 4 feet. C. FT.	4 feet to 5 feet. NO.	4 feet to 5 feet. C. FT.	5 feet to 6 feet. NO.	5 feet to 6 feet. C. FT.	6 feet to 7 feet. NO.	6 feet to 7 feet. C. FT.	7 feet to 8 feet. NO.	7 feet to 8 feet. C. FT.	8 feet to 9 feet. NO.	8 feet to 9 feet. C. FT.	Over 9 feet. NO.	Over 9 feet. C. FT.	Total. NO.	Total. C. FT.
8. MADIBARE RESERVED FOREST. Started from cairn No. 4 of Mutanki enclosure with bearing 75°. Length 80 chains with 1 chain width on either side. Area **16** acres.	Terminalia paniculata ..	66	1,267	49	1,962	41	2,647	9	937	7	1,037	1	136	..	..	173	7,986
	Terminalia tomentosa ..	9	208	5	213	4	294	..	..	..	..	..	..	..	..	18	715
	Lagerstrœmia lanceolata.	36	870	43	1,869	19	1,305	7	634	1	123	1	158	..	..	107	4,959
	Xylia xylocarpa ..	6	149	5	228	2	142	..	..	..	..	..	..	..	..	13	519
	Dalbergia latifolia ..	4	88	1	38	1	66	1	53	..	..	..	..	..	..	7	245
	Adina cordifolia ..	1	23	1	51	..	..	..	..	..	..	..	..	..	..	2	74
	Bridelia retusa	1	15	..	..	..	..	..	..	..	..	..	..	..	..	1	15
	Grewia tiliœfolia ..	3	52	..	..	..	..	..	..	..	..	..	..	..	..	3	52
	Albizzia lebbek ..	..	..	..	..	..	..	1	92	..	..	..	..	..	..	1	
	Machilus macrantha ..	..	..	..	..	1	76	1	106	..	..	..	..	..	..	2	182
	Eugenia gardneri ..	3	50	..	..	2	123	..	..	..	..	..	..	..	..	5	173
	Total ..	**129**	**2,722**	**104**	**4,361**	**70**	**4,653**	**19**	**1,822**	**8**	**1,160**	**2**	**294**	..	..	**332**	**15,012**
9. MADIBARE RESERVED FOREST. Started from cairn with bearing 30° to meet enclosure Basarberu Kaderi. Length 44·28 chains with 1 chain width. on either side Area **8·85** acres.	Terminalia paniculata ..	6	61	12	418	8	473	8	779	3	404	2	361	1	282	40	2,778
	Vitex altissima	..	..	..	..	..	..	..	..	..	..	1	90	..	..	1	90
	Lagerstrœmia lanceolata.	10	234	4	202	13	902	4	475	1	176	2	349	..	..	34	2,338
	Calophyllum tomentosum.	11	199	3	114	2	113	1	92	..	..	..	..	..	..	17	518
	Total ..	**27**	**494**	**19**	**734**	**23**	**1,488**	**13**	**1,346**	**4**	**580**	**5**	**800**	**1**	**282**	**92**	**5,724**
10, GUNDERBERUPARE RESERVED FOREST. Started from cairn No. 3 with bearing 330. Length 49 chains, width 1 chain on either side. Area **9·8** acres.	Terminalia paniculata ..	6	88	1	38	1	38	..	..	..	..	..	..	..	..	8	164
	Lagerstrœmia lanceolata.	1	23	4	184	2	142	1	106	1	141	1	181	..	..	10	777
	Xylia xylocarpa ..	14	287	9	405	..	..	..	..	..	..	..	..	..	..	23	692
	Dalbergia latifolia ..	4	84	3	133	1	76	..	..	..	..	..	..	..	..	8	293
	Grewia tiliœfolia ..	2	50	1	38	..	..	..	..	..	..	..	..	..	..	3	88
	Albizzia odoratissima ..	1	12	..	..	..	..	..	..	..	..	..	..	..	..	1	12
	Total ..	**28**	**544**	**18**	**798**	**4**	**256**		**106**	**1**	**141**	**1**	**181**	..	..	**53**	**2,026**
11. GUNDERBERUPARE RESERVEE FOREST. Started from cairn No. 14 with bearing 310. Length 50 chains, width 1 chain on either side. Area **10** acres.	Terminalia paniculata ..	34	478	28	816	11	634	10	686	1	105	1	135	..	..	85	2,854
	Terminalia tomentosa ..	3	46	..	..	..	..	..	..	..	..	..	..	..	..	3	46
	Lagerstrœmia lanceolata.	21	448	10	385	5	292	5	409	..	..	1	158	..	..	42	1,692
	Xylia xylocarpa ..	1	15	..	..	..	..	..	..	..	..	..	..	..	..	1	15
	Dalbergia latifolia ..	13	211	5	164	3	180	1	92	..	..	..	..	..	..	22	647
	Grewia tiliœfolia ..	6	111	5	158	..	..	..	..	..	..	..	..	..	..	11	269
	Bridelia retusa	1	12	..	..	..	..	..	..	..	..	..	..	..	..	1	12
	Adina cordifolia ..	1	27	1	24	1	57	..	..	..	..	..	..	..	..	3	108
	Litsæa wightiana ..	2	27	1	32	..	..	..	..	..	..	..	..	..	..	3	59
	Albizzia lebbek	..	..	..	..	..	..	..	..	..	..	1	141	..	..	1	141
	Total ..	**82**	**1,375**	**50**	**1,579**	**20**	**1,163**	**16**	**1,187**	**1**	**105**	**3**	**434**	..	..	**172**	**5,843**

SECTION 3.—PLANTATIONS.

286. Some data regarding the rate of growth of *Hopea parviflora* were collected during the preparation of this plan. Curves were drawn, against age, and heights of mean dominant stems of *Hopea parviflora* in the Someshwar plantations. Mean heights were obtained by measuring about 15 to 20 dominant stems in each plantation and striking the average. The following table shows the rate of height growth of *Hopea parviflora* during its first ten years :—

Age in years.	Height in Feet.	Height in Inches.	Age in years.	Height in Feet.	Height in Inches.
1	0	4	6	6	1
2	0	11	7	7	10
3	1	9	8	9	6
4	3	0	9	11	4
5	4	6	10	13	4

CHAPTER VII.—ESTIMATE OF THE CAPITAL VALUE OF THE FORESTS.

287. The forests dealt with are so irregular in composition and constitution that no useful purpose would be served by attempting to assess their capital value. Therefore no estimate is made.

PART II

Future Management Discussed and Prescribed.

CHAPTER I.—BASIS OF PROPOSALS.

SECTION 1.—GENERAL OBJECTS OF MANAGEMENT.

288. The objects of management are—

(1) The maintenance of a well regulated supply of water to the district by conserving the evergreen forests, clothing the upper catchment areas of the principal rivers and streams, and to prevent undue erosion consequent on swift drainage over a narrow sea-board.

(2) The realization of the maximum yield of forest produce, such as timber, fuel, cutch, sandalwood and minor products, under suitable methods of treatment which are based upon the silvicultural requirements of each species, and which are calculated to bring the forest to as nearly normal a condition as possible.

(3) The regeneration of the forest with species of present utility value by systematic tending of existing natural regeneration ; artificial measures will be used to supplement natural regeneration where the latter is deficient.

(4) The improvement of the condition of the forest and the fertility of the soil by organized protective and silvicultural measures.

SECTION 2.—METHODS OF TREATMENT TO BE ADOPTED.

289. The following silvicultural methods of treatment are prescribed in order to achieve the above objects of management :—

(*a*) A ' Selection ' or ' Group Selection ' method, whereby exploitable stems are removed, and the gaps thus caused are regenerated with useful species either by natural or artificial measures ;

(*b*) The ' Clear-felling ' method, combined with concentrated artificial regeneration, sometimes along with the cultivation of field crops ;

(*c*) The ' Simple Coppice ' method, supplemented by artificial regeneration of blank areas devoid of utilizable species ; and

(*d*) Improvement Fellings.

SECTION 3.—WORKING CIRCLES, THEIR AREA AND DISTRIBUTION—REASONS FOR THEIR CONSTITUTION.

290. *The Timber Working Circle.*—Area 7,681 acres. Mature or nearly mature timber-areas which can be worked with reasonable economy, and areas felled over in the recent past in the ranges of Coondapoor, Shankaranarayana and Udipi have been included in this working circle. The object is to supply a sustained quantity of timber to Coondapoor market and sleepers to the railways. The areas allotted to this working circle constitute irregular crops of mixed deciduous species and are suitable for treatment under a method of selection intended to remove trees of and above defined girth limits, with the effective regeneration of the gaps thus created.

291. *The Clear-felling Experimental Working Circle.*—Area 200 acres. The area assigned to this working circle is limited to 200 acres to be clear-felled and regenerated during the period of this plan. The establishment of even-aged woods of deciduous species by concentrated regeneration measures has not hitherto been attempted in the division, and the prescriptions for this working circle are largely on an experimental basis in order to study the suitability of the method and the costs of formation, during the currency of this plan.

292. *The Plantation Working Circle.*—Area 3,793 acres. To this working circle have been assigned all existing plantations in the division. A separate working circle has been constituted in order to arrange for systematic tending of the existing plantations under shelterwood.

293. *The Fuel Working Circle.*—Area 19,139 acres. This working circle includes all reserves fit for fuel extraction at a reasonable cost.

294. *The Protection Working Circle.*—Area 224,305 acres. All the ghat forests and such of the plains and foot-hill reserves as are not prescribed for working during the period of this plan are included in this working circle.

295. *The Cutch Working Circle.*—Area 13,982 acres. The reserves and unreserves of Coondapoor Range containing a fair distribution of *Acacia sundra* tree growth have been included in this working circle.

296. *The Sandal Working Circle.*—Area 175,026 acres. This working circle includes all the reserves and lands at the disposal of Government which contain an appreciable quantity of sandal growth.

297. *The Minor Produce Working Circle.*—This working circle comprises all reserved forests and unreserved lands at the disposal of Government.

298. *The Grazing Working Circle.*—This working circle constitutes the entire working plan area with the exception of coupes and regeneration areas specially closed to grazing.

SECTION 4.—PERIOD OF THE WORKING PLAN AND NECESSITY FOR INTERMEDIATE REVISION.

299. The period covered by this working plan is ten years, from the 1st April 1932 to the 31st March 1942. Revision of the plan should be taken up in 1941, so as to complete the field work before its expiry in 1942.

CHAPTER II.—WORKING PLAN FOR THE TIMBER WORKING CIRCLE.

SECTION 1.—GENERAL CONSTITUTION OF THE CIRCLE AND CHARACTER OF THE VEGETATION.

300. The objects of this working circle are—

(1) To supply the annual timber requirements of Coondapoor and Hangarkatte markets, and to provide for the production of sleepers for supply to the railway company. The present depression in the timber trade in particular, and the world economic depression in general, necessitate the contraction of the output of timber to the absolute minimum requirements of the market.

(2) To regenerate effectively the gaps created by the removal of exploitable trees, with shade-bearing and light-demanding species of present utility value.

(3) To restrict the disturbance of the tree canopy in order to avoid undue exposure of the soil.

301. On a rough estimation, the total timber-bearing areas of the division which can be worked with reasonable economy when the timber trade resumes its normal conditions, and facilities for extraction and transport of timber become more favourable, is 60,000 acres. Regeneration operations, which hitherto have received but scanty attention, are also, of necessity, prescribed on a tentative scale, which fact has no inconsiderable bearing upon a restriction of the area of the coupes to be worked during the period of this plan. The limits imposed should provide the management with reasonable opportunity of achieving effective results within the decade. Suitable timber bearing areas, possible of inclusion in the working circle at future revisions—should trade conditions become favourable by then—are located in Mettukallugudde, Baregundi, Madibare, Koraticalbare, Megany Valley, Gundaberupare, Someshwar and Andar reserves; but owing to the immaturity of the present crop, such areas are not likely to become fit for exploitation during the next 20 or 30 years. Therefore this working circle is at present delimited to coupes proposed for felling during the period of this plan and those which were felled during the last decade but not regenerated. Such felled coupes have also been indicated on the detailed map, since a fair quantity of timber remains on them, and it is probable they will again be worked over and regenerated during the first felling cycle.

302. The major part of the vegetation in this working circle is of a deciduous type, but evergreen or semi-evergreen types have also been included, it being impossible in practice to exclude them, if contiguous areas for annual working are to be obtained. The crop consists principally of secondary regrowth from past 'kumri' clearings. Young crops of 'kumri' origin are more or less of uniform age and girth, and form irregular sized groups, in which all individuals measure between 3 to 5 feet in girth at breast height. In the natural deciduous forest on the other hand, the crop is irregular. Evergreen or semi-evergreen areas resemble a 'selection type,' all age gradations being represented on a single area. Parts of this working circle have been worked formerly under the so-called 'Selection System,' this being a system of exploitation based on convenient but arbitrary girth limits. There has been an almost complete disregard for the necessity of replacing the crop thus removed. This has resulted in the presence of extensive gaps in the canopy with insufficient natural regeneration of useful tree species on the ground, and has instead promoted the incidence of noxious shrubs like Strobilanthes. The more mature parts of this working circle which have not yet been worked, are those selected for the next ten years' fellings. The distribution of exploitable trees of saleable species is irregular. Semi-evergreen or moist deciduous localities often contain a variety of species not utilizable at present. In semi-evergreen areas, unimportant species readily spring up under shade, but in true evergreen localities *Hopea parviflora* regeneration close to mother trees is satisfactory. In areas containing *Xylia xylocarpa* any disturbance of the soil has resulted in the production of root suckers which however have rarely survived the subsequent oppression of Strobilanthes or other fast-growing shrubs. The ground flora is of heterogeneous description, largely composed of dense Strobilanthes, but evergreen associations and transitional conditions are common. The principal utilizable species occurring in this working circle are *Terminalia paniculata, Terminalia tomentosa, Lagerstrœmia lanceolata, Xylia xylocarpa, Dalbergia latifolia, Hopea parviflora* and *Artocarpus hirsuta.* Teak does not occur.

303. *Felling series.*—The working circle is divided into four felling series—two in Coondapoor, one in Shankaranarayana and one in Udipi Range. The following table shows the allotment of areas to each felling series :—

Range.	Felling series number.	Constitution.			Total area of each felling series in acres.
		Reserve.	Area in acres of		
			Unfelled portions.	Felled coupes.	
Coondapoor	I	Megany Valley ..	687	..	1,989
		Madibare	..	1,138	
		Koraticalbare ..	..	164	
Do.	II	Madibere	579	1,361	1,940
Shankaranarayana	III	Doddinamane ..	1,400	485	1,885
Udipi	IV	Andar	471	..	1,867
		Someshwar	..	1,396	
				Total ..	7,681

Of the above four series, number II will be a reserve series to be opened for timber extraction when the yield from the other three series is not enough to meet the demand at Coondapoor.

304. *A brief description of the* character and constitution of the vegetation in each felling series is given below.

305. Felling Series I comprises the mature or nearly mature deciduous timber areas in Megany Valley reserve and part of the worked coupes in Madibare and Koraticalbare reserves. The principal species occurring in the crop are *Terminalia paniculata, Lagerstrœmia lanceolata, Dalbergia latifolia, Xylia xylocarpa* and *Vitex altissima.* In evergreen or semi-evergreen patches *Lophopetalum wightianum, Myristica canarica, Lagerstrœmia flos-reginœ,* and *Eugenia* and *Dipterocarpus* species are represented. Tree canopy is complete or nearly so in unfelled areas. The distribution of present utility species is 'patchy'; mature trees are occasional and rarely more than two trees per acre are suitable for extraction now. The height of principal species varies from 55 feet to 60 feet in favourable localities. Girths of 4 feet to 5 feet and 5 feet to 6 feet are satisfactorily represented but the lower girth classes are deficient. In moist deciduous or semi-evergreen situations a pronounced middle storey consisting of *Aporosa lindleyana, Olea dioica, Cinnamomum* species, etc., is present. The ground flora for the most part consists of an evergreen or a transitional type but in places patches of Strobilanthes eist. Natural regeneration of principal tree species is poor. Canes are found in semi-evergreen localities.

306. Felling Series II consists of the southern and the south-eastern parts of Madibare reserve. On the northern bank of Gundiana hole, there is a belt of *Hopea parviflora* poles. Mature trees of this species were extracted in 1927–28. The rest of the series consists of a pronouncedly moist deciduous type sometimes passing into semi-evergreen. The density of stock is satisfactory and canopy is complete in most places. Utilizable timber species are distributed in greater proportion and more evenly than in the foregoing series. The height of principal species varies from 55 to 60 feet. Medium girth classes predominate. Natural regeneration is scanty. The ground flora consists of an evergreen association including transitional types. A pronounced middle storey is present over most of this area. Canes are fairly abundant.

307. Felling Series III is formed out of part of Doddinamane reserve and includes the areas worked in the recent past in this reserve. Improvement fellings, which consisted in the removal of inferior species in favour of the useful ones, and climber cuttings, were done over part of this series from 1911 with beneficial results, but the present crop in such areas looks open in consequence. The principal species in the tree crop are *Lagerstrœmia lanceolata, Terminalia paniculata, Xylia xylocarpa, Dalbergia latifolia, Terminalia tomentosa* and *Vitex altissima. Terminalia tomentosa* is found towards the western parts of the reserve in greater numbers than elsewhere. *Xylia xylocarpa* grows best on Karurgudde and its slopes. Tree growth deteriorates in quality towards the western end of the reserve where the canopy is more open than elsewhere. Density of stock is moderately satisfactory. Height growth varies from 50 to 55 feet. There is a deficiency of younger girth classes. Root-suckers of *Xylia xylocarpa* are suppressed by Strobilanthes and other fast-growing shrubs. Regeneration of other principal species is negligible. In many parts the ground flora consists of a dense mass of tall Strobilanthes. In moist locations a transitional type of undergrowth consisting of *Glycosmis, Helicteres Isora,* etc., is common.

308. Felling Series IV comprises the past worked coupes of Someshwar reserve, and for the next ten-year period, a belt of evergreen and semi-evergreen forest along the middle slopes of Andar reserve in the neighbourhood of Narsambail enclosure. The principal utility species is *Hopea parviflora. Dipterocarpus indicus, Artocarpus hirsuta, Pœciloneuron indicum, Terminalia paniculata* and numerous soft-wooded species form the bulk of the crop, which is at present preponderatingly immature. The ten coupes selected for felling and regeneration have not previously been worked departmentally, although there are frequent evidences of past extraction, probably illicit. The six felled coupes in Someshwar reserve are included in this series in order that regeneration of *Hopea* and other important species, already partly established, shall continue to receive adequate attention. Almost the entire area has been enumerated and surveyed by the ' Logging Branch ' during the years 1925–28. The results of these enumerations are utilized now for the purpose of defining annual coupes to be worked. Four coupes, subsequently located, were enumerated by the working plans staff in 1930–31.

SECTION 2.—DIVISION OF THE AREA.

309. No subdivision of the area into permanent blocks or compartments is found necessary. Each reserve included in the working circle is usually recognized as a block bearing the name of the reserve. Temporary compartments for purposes of description of the crop, were formed during the course of stock-mapping and these are shown on the stock-maps. The first ten coupes to be felled in each felling unit are indicated in the special map prepared for each series.

SECTION 3.—ANALYSIS AND VALUATION OF THE CROP.

310. Before the working plans staff commenced work, a large area had been stock-mapped by the staff of the division, and although the analysis of the crop did not everywhere correspond with ideas by which stock-mapping had proceeded elsewhere in South Kanara, the maps were utilized and incorporated without change for the most part, as it was judged impossible at the outset to go over the entire area again in detail. Those areas which the divisional staff had not gone over were stock-mapped by the working plans staff. The vegetational types are indicated in Survey of India sheets on a scale of 2 inches to a mile. Coupes worked in the past have been indicated on the detailed maps as far as could be ascertained from the records.

311. Enumeration of all saleable species of and over 3 feet in girth at breast height in one-foot girth classes was made by the working plan staff over 101·6 acres of the area

prescribed for felling during the period of this plan, in Felling Series I. Enumerations were done one chain on either side of cut lines. An abstract of the enumerations is given below :—

Breast-height girth.

Species.	3′—4′.		4′—5′.		5′—6′.		6′—7′.		7′—8′.		Over 8′.		Total.	
	Number of trees.	C. ft.	Number of trees.	C. ft.	Number of trees.	C. ft.	Nymber of trees.	C. ft.	Number of trees.	C. ft.	Number of trees.	C. ft.	Number of trees.	C. ft.
Terminalia paniculata	44	756	84	2,778	53	2,578	42	3,023	21	2,143	7	830	251	12,108
Lagerstrœmia lanceolata	96	2,098	147	5,930	107	6,858	68	6,191	18	1,969	9	1,478	445	24,524
Dalbergia latifolia.	3	65	..	..	1	76	..	..	..	..	..	..	4	141
Total ..	**143**	**2,919**	**231**	**8,708**	**161**	**9,512**	**110**	**9,214**	**39**	**4,112**	**16**	**2,308**	**700**	**36,773**
Average per acre ..	1·4	28	2·2	85	1·6	94	1·6	155	..	..	..	..	6·8	364

312. In Felling Series II, a trial enumeration over 8·85 acres only was done and the results are given below :—

Breast-height girth.

Species.	3′—4′.		4′—5′.		5′—6′.		6′—7′.		7′—8′.		Over 8′.		Total.	
	Number of trees.	C. ft.	Number of trees.	C. ft.	Number of trees.	C. ft.	Number of trees.	C. ft.	Number of trees.	C. ft.	Number of trees.	C. ft.	Number of trees.	C. ft.
Terminalia paniculata	6	61	12	418	8	473	8	779	3	404	3	643	40	2,778
Lagerstrœmia lanceolata	10	234	4	202	13	902	4	475	1	176	2	349	34	2,338
Calophyllum tomentosum	11	199	3	114	2	113	1	92	..	..	..	..	17	518
Total ..	**27**	**494**	**19**	**734**	**23**	**1,488**	**13**	**1,346**	**4**	**580**	**5**	**992**	**91**	**5,634**
Average per acre ..	3	55	2·2	84	2 6	169	..	..	2·5	331	..	..	10	636

313. In Felling Series III, cent per cent enumeration and numbering of all saleable species, of and over 4½ feet in girth at breast height, were carried out by the district staff in 1930 over an area of 490 acres. Actual girth at breast-height and approximate lengths of boles were recorded. The results are tabulated below :—

Breast-height girth.

Species.	4½′—5′.		5′—5½′.		5½′—6′.		6′ and over.		Total.	
	Number of trees.	C. ft.	Number of trees.	C. ft.	Number of trees.	C. ft.	Number of trees.	C. ft.	Number of trees.	C. ft.
Lagerstrœmia lanceolata ..	207	6,841	197	8,343	216	8,817	633	56,164	1,253	80,165
Terminalia paniculata	293	7,798	275	9,300	215	9,378	654	46,426	1,437	72,902
Xylia xylocarpa ..	279	7,000	182	5,961	84	3,460	72	3,630	617	20,051
Terminalia tomentosa.	147	3,991	104	3,703	78	3,490	143	9,466	472	20,650
Dalbergia latifolia ..	20	513	8	307	9	390	8	415	45	1,625
Total ..	**946**	**26,143**	**766**	**27,614**	**602**	**25,535**	**1,510**	**116,101**	**3,824**	**195,393**
Average per acre ..	2	53	1·5	56	1·2	52	3·1	237	7·8	399

314. Of the total area enumerated and surveyed by the Logging Branch in 1925–28 in the Andar and Someshwar reserves, an area of 316 acres is included in Felling Series IV. Enumerations were done by the Logging Branch over 50 per cent of the area in 4″ diameter classes from 12″ and upwards by ocular estimate of the diameter at mid-bole height of the utilizable trees. The results are given below :—

Mid-diameter classes—Ocular estimate only.

Species.	12″—16″.	16″—20″.	20″—24″.	24″—28″.	28″—32″.	Over 32″.	Total.
	C. FT.	C. FT.	C. FT.	C. FT.	C. FT.	C. FT.	C. FT.
Hopea parviflora.	4,406	10,885	9,931	9,056	2,896	1,594	38,768
Terminalia paniculata ..	397	367	35	44	108	..	951
Lagerstrœmia lanceolata ..	149	21	64	46	..	..	280
Artocarpus hirsuta ..	16	41	46	..	..	..	103
Total ..	**4,968**	**11,314**	**10,076**	**9,143**	**3,004**	**1,594**	**40,102**
Average per acre.	31	71	64	58	19	10	253

315. In addition to the above, an area of 155 acres outside the surveyed areas was enumerated cent per cent for *Hopea parviflora* only, by the working plans party and the results are shown below :—

Breast-height girth.

Species.	Strip number.	3′—4′. Number of trees.	3′—4′. C. ft.	4′—5′. Number of trees.	4′—5′. C. ft.	5′—6′. Number of trees.	5′—6′. C. ft.	6′—7′. Number of trees.	6′—7′. C. ft.	7′—8′. Number of trees.	7′—8′. C. ft.	Over 8′. Number od trees.	Over 8′. C. ft.	Total. Number of trees.	Total. C. ft.
Hopea parviflora.	1	177	6,169	135	1,938	87	7,560	40	4,792	10	1,354	5	1,105	454	22,918
	2	406	13,937	284	17,553	168	15,763	59	8,105	36	6,329	27	7,137	980	68,824
	3	67	2,474	64	4,235	61	6,946	32	4,052	13	2,285	9	2,112	246	22,104
Total ..		650	22,580	483	23,726	316	30,269	131	16,949	59	9,968	41	10,354	1,680	113,846
Average per acre ..		4·2	145	3·1	153	2	195	0·8	109	0·4	64	0 3	67	11	734

SECTION 4.—METHOD OF TREATMENT.

316. *Silvicultural system.*—The forests of North Mangalore Division are not yet ripe for the adoption of any of the conventional or classical systems of management. Apart from their extremely irregular nature, their only partial recovery from past abuses and the uncertain nature of future markets, our knowledge of them extends in no direction adequately to warrant the adoption of any of the premises which are ordinarily essential as a working basis for a plan. The sole experience yet gained in the regeneration of North Mangalore forests relates to *Hopea parviflora* under some form of shelterwood, such as is found in the southern parts of the division, but conditions suitable for the introduction of this species in Felling Series I to III are for the most part quite inadequately developed. The difficulties attendant on the production of natural or spontaneous growth of desirable species have already been outlined in previous paragraphs. The indifferent value of the forests themselves at present excludes the management from undertaking very expensive and concentrated methods of artificial restocking of compartments felled. More than anything else the forest requires complete rest and protection, although this alone would fail to restore many areas in less than a generation. Since material must be extracted to satisfy local markets, saleable species of exploitable size will be removed annually to the required amount. This plan prescribes merely that stems thus removed must be replaced by regeneration of similar species, whether light-demanding or partial shade-bearing, and the young crop tended until it is established beyond danger from competing growth. The length of time necessary for accomplishing this desideratum is unknown ; it will in any case vary from place to place according to the factors of the locality. Any system involving ‘ periodic blocks ’ is thus *at present* ruled out until such time as sufficient experience has been gained to furnish us with definite information. Similarly, no growth-data whereby an estimate might be made of the time-period requisite for one girth-class to pass into the next is available. Ring countings and stem analyses are of uncertain value in Kanara and the staff was inadequate to conduct lengthy investigations of a statistical nature. Neither has it been possible to complete other than a fractional enumeration and analysis of the crop on a few of the most mature areas. Accordingly, no system based on the volume of growing-stock and distribution of age-classes can be applied. The prescriptions which follow entail that a felling and removal of trees of and above certain empirical girth-limits is combined with an area ‘ frame-work ’ which regulates the size of the cut. This is worked on a tentatively adopted felling cycle, which however bears no weight on the determination of the cut in future periods. Complete regeneration of the areas now taken up is not aimed at within any definite period. Until the management have discovered a practical ‘ *modus operandi* ’ for regeneration under all conditions met with it would be unwise to tie their hands in any rigid fashion. Their sole obligation of silvicultural importance is to ensure that the forest is not further depleted, by replacing the stock now removed with species which will be useful in the future. The forthcoming period should be adequate to settle all such problems of regeneration, if seriously tackled. For this reason, it is proposed in this plan to form a preliminary series of coupes to be worked without regard for any rigid system of management, but solely as a means of deriving by empirical and experimental measures as much data as possible relating to regeneration, in order to form a ground work for a future regularized system of working. Concurrently, a start will be made in the collection of statistics relating to the rates of growth of various species and age-classes in the present crop. When all such relevant data are available, it will be time enough to consider formulating a rigid frame-work of management. As shown below (in paragraph 327) no consideration of approximating the annual yield to the total possibility of the forest need concern the management at present, for although the crop is everywhere preponderatingly immature, the annual possibility of the entire forest property is greatly in excess of present demand, and the area proposed for working is a very small fraction of the total timber-bearing forests of the division.

317. Consequently the silvicultural system will be a selection method whereby mature trees are exploited with artificial regeneration of the gaps created by felling where natural regeneration is insufficient.

318. *Rotation.*—No information is available to enable the rotation to be definitely fixed. The rate of growth, although possibly a trifle slower in this division than in South Mangalore, is probably not widely different from it. A rotation of ninety years similar to that adopted in Mangalore South Division for its Timber Working Circle, is suggested, although for reasons given above, it is of no immediate concern.

319. *Felling cycle.*—A tentative felling cycle of thirty years is adopted. A shorter felling cycle may be feasible but in view of the fact that fellings in the past were done down to a girth-limit of as low as 4½ feet, nothing less than a thirty years cycle is considered advisable at present.

320. *Exploitable size.*—Trees of saleable species of and above the girth-limits prescribed below will be considered fit for extraction :—

Hopea parviflora and other evergreen species ..	6 feet at breast-height.
Xylia xylocarpa	4½ feet at breast-height.
Other deciduous species	6 feet at breast-height.

321. Timber extraction in the past in localities similar to the coupes prescribed under this working circle was based on an arbitrary convenient low girth-limit of 4½ to 5 feet at breast-height for all species. (Reference has already been made to this in Chapter V, Part I, of this plan.) This has resulted in inordinate openings in the tree canopy followed by the previously mentioned rapid invasion and semi-permanent occupation of the ground by Strobilanthes and other objectionable types. Therefore restriction in the disturbance of the tree canopy is imperative. This is partly achieved by raising the girth limits.

322. Reference has already been made to the fact that the division derives a very small profit from timber operations. Third-grade logs of *Terminalia paniculata*, *Terminalia tomentosa* and *Lagerstrœmia lanceolata* are in no great demand at Coondapoor. In the opinion of the writer the low prices obtained at the recent timber sales at Coondapoor are partly attributable to the large quantities of inferior grade logs supplied at the market. Higher grade logs are bound to command better sale value. The minimum mid-girth of a second grade log is 4 feet under bark which would approximately correspond to 5 feet at breast-height over bark. Similarly for a first-grade log the minimum mid-girth under bark is 5 feet, which would correspond to 6 feet at breast-height. By the adoption of a girth-limit of 6 feet for species other than *Xylia xylocarpa*, which species will be sawn into sleepers, the bulk of the timber supplied to the market should consist of first and second grades and the percentage of third-grade logs will be considerably minimised.

323. Deciduous species, given protection from fire, are found to keep sound up to a girth of 6 feet and more at breast-height. It would therefore be economical to maintain the girth-limits prescribed above. *Hopea parviflora* is almost entirely confined to the southern parts of the division, particularly in Felling Series IV. Although at present the Hopea crop is predominantly immature and fellings accordingly will be somewhat diffuse except in a few mature groups, no reason can be found for reducing the girth-limit below 6 feet at breast height or above buttresses. To do so would be to sacrifice probably the most vigorous period of the trees' life. Were it not for the likelihood of unsoundness appearing in this species at ages corresponding to 8 or 9 feet girth, there would be good reason for adopting some such higher limit for extraction ; and again, if this were prescribed, the series would require to be closed for the next thirty years, as the material to be extracted would not repay the expenses of working. A girth-limit of 6 feet is therefore adopted.

324. *Coupes.*—Each felling unit in this working circle is divided into ten coupes for felling during the period of this plan. The average annual coupe in each unit is—

		ACS.
Felling Series	No. I	66
Do.	No. II	65
Do.	No. III	63
Do.	No. IV	47

325. *Calculation of the possibility.*—The possibility of this forest is, as indicated above in paragraph 316, not at present susceptible of accurate calculation. On an area basis

alone, we may be sure that the annual cut will not exceed, nor, indeed approach the total possibility of the timber-bearing forest of the division. A very crude method of calculating the possibility is given below.

326. The total accessible timber-bearing areas of the division, including both mature and immature forests but excluding the ghat tracts, is approximately 60,000 acres. Enumerations were made during the preparation of the plan in what are considered to be fairly well stocked reasonably mature deciduous areas, and the results disclose that, on an average there are about 9 trees per acre of utilizable species, of and above a girth of 3 feet at breast-height. Taking into consideration all the several types of forests met with, on a very conservative estimate, an average acre of timber forest may then be assumed to contain 6 trees of saleable deciduous species. Each tree when converted at maturity may be estimated to contain 30 cubic feet of merchantable timber in the log. The yield from an average acre during one rotation will be 6 × 30 cubic feet = 180 cubic feet. Assuming that the rotation for deciduous species is 90 years, the average annual increment per acre of utilizable species would be 2 cubic feet. The total annual increment put on by the entire timber bearing area, excluding species not at present utilizable, will, therefore, be 60,000 × 2 = 120,000 cubic feet.

327. The total annual yield prescribed for this working circle is approximately 60,000 cubic feet of standing volume of timber species which when reduced to merchantable timber will be 60,000 × 0·6 = 36,000 cubic feet. The annual yield is therefore less than a third of the possibility of the forest.

328. The annual yield will be regulated by area with an approximate volume guide. Since marking for timber extraction is based on silvicultural considerations, any forecast of yield can be only approximate. The probable standing volume of timber of utilizable species is shown in the following table. The figures are only approximate, to serve as a rough guide on which the management may base estimates ; they are calculated from the results of enumerations given in paragraphs 311 to 315.

329. *Yield Statement.*

Gross volume of standing trees.

Coupe number.	Area in acres.	Lagerstrœmia lanceolata. Number of trees.	Lagerstrœmia lanceolata. C. FT.	Terminalia paniculata. Number of trees.	Terminalia paniculata. C. FT.	Xylia xylocarpa. Number of trees.	Xylia xylocarpa. C. FT.	Terminalia tomentosa. Number of trees.	Terminalia tomentosa. C. FT.	Dalbergia latifolia. Number of trees.	Dalbergia latifolia. C. FT.	Total. Number of trees.	Total. C. FT.
Felling Series I.													
I	76	35	3,471	57	4,854	..	..	..	..	..	..	92	8,325
II	65	59	5,833	54	4,652	..	..	..	..	..	..	113	10,485
III	60	79	8,001	38	3,585	..	..	..	..	..	..	117	11,586
IV	64	69	7,125	40	3,990	..	..	..	..	..	..	109	11,115
V	62	62	7,002	60	5,738	..	..	..	..	..	..	122	12,740
VI	63	65	6,426	46	4,347	..	..	..	..	..	..	111	10,773
VII	76	81	6,682	39	2,327	..	..	..	..	..	..	120	9,009
VIII	79	50	5,097	39	2,032	..	..	..	..	..	..	89	7,129
IX	72	25	3,570	30	2,850	..	..	..	..	..	..	55	6,420
X	70	44	5,392	33	3,049	..	..	..	..	..	..	77	8,441
Total ..	**687**	**569**	**58,599**	**436**	**37,421**	..	..	..	..	..	..	**1,005**	**96,023**
Felling Series II.													
I	64	51	7,232	102	13,184	..	..	..	..	..	..	153	20,416
II	56	46	6,554	92	11,948	..	..	..	..	..	..	138	18,502
III	56	48	6,780	96	12,360	..	..	..	..	..	..	144	19,140
IV	59	48	6,780	96	12,360	..	..	..	..	..	..	144	19,140
V	61	49	6,893	98	12,566	..	..	..	..	..	..	147	19,459
VI	57	45	6,328	89	11,536	..	..	..	..	..	..	134	17,864
VII	59	48	6,780	96	12,360	..	..	..	..	..	..	144	19,140
VIII	56	47	6,667	94	12,154	..	..	..	..	..	..	141	18,821
IX	56	45	6,441	91	11,742	..	..	..	..	..	..	136	18,183
X	55	45	6,441	91	11,742	..	..	..	..	..	..	136	18,183
Total ..	**579**	**472**	**66,896**	**945**	**121,952**	..	..	..	..	..	..	**1,417**	**188,848**
Felling Series III.													
I	60	96	9,300	54	4,500	72	2,700	1	50	..	..	223	16,550
II	52	83	8,060	47	3,900	62	2,340	1	50	..	..	193	14,350
III	56	89	8,680	50	4,200	67	2,520	1	50	..	..	207	15,450
IV	50	75	7,250	87	6,750	80	2,900	45	1,500	1	50	288	18,450
V	54	81	7,830	94	7,290	86	3,132	48	1,620	1	50	310	19,922
VI	55	82	7,975	95	7,425	88	3,190	49	1,650	1	50	315	20,290
VII	62	93	8,990	87	8,370	99	3,596	55	1,860	1	50	335	22,866
VIII	79	47	4,187	86	7,110	55	1,580	31	2,765	1	30	220	15,672
IX	78	46	4,134	85	7,020	54	1,560	31	2,730	1	30	217	15,474
X	79	47	4,187	86	7,110	55	1,580	31	2,765	1	30	220	15,672
Total ..	**625**	**739**	**70,593**	**771**	**63,675**	**718**	**25,098**	**293**	**15,040**	**7**	**290**	**2,528**	**174,696**
Felling Series IV.													
I	50	..	..	..	..	55	7,251	..	..	..	..	55	7,251
II	45	..	..	..	..	54	8,549	..	..	..	..	54	8,549
III	30	..	..	..	..	61	10,785	..	..	..	..	61	10,785
IV	30	..	..	..	..	61	10,786	..	..	..	..	61	10,786
V } Number of trees not available.	82	..	64	..	678	..	13,308	..	..	..	..	..	14,050
VI	34	..	..	..	88	..	12,074	..	..	..	..	..	12,162
VII	48	..	..	..	82	..	10,158	..	46	..	..	..	10,286
VIII	72	..	92	..	146	..	9,076	..	46	..	..	..	9,360
IX	40	..	64	..	114	..	11,108	..	..	..	..	..	11,286
X	40	..	42	..	..	..	10,996	..	82	..	..	..	13,120
Total ..	**471**	..	**262**	..	**1,108**	**231**	**106,091**	..	**174**	..	..	**231**	**107,635**

In working out the yield from coupes V to X of Felling Series IV, which were enumerated by ocular estimate by the Logging Branch in 1926-27, a mid-bole diameter of 16 inches is reckoned to correspond to a girth of 6 feet at breast-height in the foregoing yield calculations. In order to determine the relationship between mid-bole girth and breast-height girth, the figures relating to 328 *Hopea parviflora* trees felled in the past in Nalkur reserve of South Mangalore Division, were abstracted from Form 3, in one foot girth-classes from 5 feet girth and upwards. The average breast-height and corresponding mid-girths under each girth class were worked out and plotted. The curve so drawn indicates that a girth of 6 feet at breast-height would correspond to 58 inches mid-girth ; now, a mid-diameter of 16 inches would be equivalent to only 51 inches in girth ; but in view of the fact that these coupes (V to X) may not be due for felling until 1938–39, and considering the increment that will accrue during the period 1927 (the year of enumeration) to 1939, it is safe to include trees, with a mid-diameter of 16 inches in the yield calculations.

The foregoing yield statements furnish only the gross volume of standing timber. In order to estimate the net volume of timber after conversion a factor 0·75 for *Hopea parviflora* and 0·60 for deciduous species may be tentatively adopted until more accurate volume tables, based on the measurements of a large number of trees, are compiled. The above reduction factors approximate to those adopted in the South Mangalore Working Plan.

SECTION 5.—EXPLOITATION.

330. Annual coupes will be surveyed and demarcated by a cut line 12 feet wide in January preceding the year of felling.

331. Marking will be restricted to trees oi species that can be marketed at a profit, of and above the girth-limits prescribed under section 4. Before marking is begun the District Forest Officer shall communicate to the Range Officer the species to be marked for extraction.

No unduly large openings in the canopy likely to cause deterioration of the soil by exposure, should be created.

Where a group of mature trees exists the marking officer must use his discretion and decide which trees should be extracted and which retained. Out of two exploitable trees within thirty feet of each other only one shall be marked for felling. Vigorously-growing saleable species should be retained in preference to trees whose period of vigorous increment has culminated or nearly culminated.

Exploitable trees standing over promising advance growth or vigorously growing poles of utilizable species, shall be marked. In such cases the restriction as to distance imposed under the above sub-paragraph need not be exercised.

Marking in the neighbourhood of existing gaps caused by natural or accidental disturbance of the canopy should be done with caution depending on the conditions prevailing in each locality. Where the ground flora is of an evergreen character, suitable for the introduction of evergreen species, further widening of the gaps is not desirable. Where the type is of a deciduous nature the enlargement of the gap, if it is not already of adequate dimensions, will be necessary (vide paragraph 350).

Selected logs of species which are not of immediate sale value may be extracted, at the discretion of the District Forest Officer, if he considers that the use of such species might be popularized.

Dead and windblown trees of all species and of any dimensions may be extracted if they can be sold at a profit.

332. Rigid rules for marking cannot be prescribed for forests of irregular character such as are found in this working circle. The marking officer should exercise his silvicultural talent and conduct the marking judiciously, satisfying the requirements of individual cases.

333. Marking shall be completed in the month of February preceding the year of felling. Marking shall be done by an officer not below the rank of a Ranger. It shall be inspected and approved by the District Forest Officer before felling is commenced.

334. All trees marked for felling shall be serially numbered with tar at two places; one approximately at breast-height and the other as close to the ground on the trunk as possible. Breast-height girth over bark and the estimated length of merchantable bole shall be entered in Form 3 at the time of marking. On the completion of marking the Range Officer shall submit his estimate together with a statement showing the number of trees marked under each girth class and each species, the estimated gross volume and the anticipated converted volume, to the District Forest Officer.

335. Felling will be commenced in April as soon as the estimates are sanctioned and shall be completed by August. Caution and commonsense should be exercised in felling trees so that they fall in a direction likely to cause the minimum damage to the felled tree, as also to adjoining tree growth and regeneration, if any. The use of cross cut saws should be encouraged to reduce wastage in conversion.

336. As an experiment about 10 per cent of the logs shall be squared and properly dressed so as to have an attractive appearance. It is anticipated that the extra expense incurred and the loss of timber in conversion would be more than compensated by the enhanced sale value of the logs. Should this procedure prove remunerative, as it has been in other districts, all the logs should be carefully dressed.

337. When a tree is felled the length of its utilizable bole and its mid-girth under bark shall be recorded in the appropriate columns of Form 3 below the entries already made at the time of marking. Each log converted from a tree shall bear the indicative letter of the species, year of felling, tree number followed, when more than one log is obtained from the same tree, by letters in alphabetical order, and the depot number when the log is dragged to a depot. An example of the details to be chiselled on each log is given below :—

B.T. (Benteak, *Lagerstrœmia lanceolata*).
1932–33 (Year of felling).
1105-A (Log number).
2806 (Depot number).

338. *Dragging.*—Departmental elephants will ordinarily be utilized in dragging timber from stump site to transport roads or cart-tracks. The utilization of elephant power should be conserved by constructing carefully aligned feeder roads in the annual coupes. Selection of suitable depot sites should be made well in advance of dragging. Logs intended for conversion into sleepers or scantlings should be dragged to the nearest saw pit. Wherever possible sawing at stump site itself should be encouraged. Dragging should be completed before the end of December.

339. *Sawing.*—*Xylia xylocarpa* and *Hopea parviflora* logs shall be converted into railway sleepers and scantlings, if the operations continue to be remunerative. Conversion should be done as soon as possible after the tree is felled, to prevent cracking.

340. *Stacking.*—All sawn material, either in the forest or at the depots, shall be properly stacked, allowing ample interspace for the circulation of air. Wherever possible stacking should be done under shade, and under no circumstances should sawn material be in direct contact with the ground. The method of stacking recommended is given under "Miscellaneous prescriptions" paragraph 594.

341. *Carting.*—Timber shall be removed as quickly as possible from the forest to riverside depots, before the commencement of the monsoon. Timber from Felling Series I and II shall be carted to Wandse, from Felling Series III to Sowda, and from Felling Series IV to Gurpur.

342. *Boating.*—Timber from Felling Series I, II and III will be boated or rafted to Coondapoor, whence sleepers, if any, shall be despatched by country craft to Mangalore. Timber from Felling Series IV, which will consist mainly of sleepers, will be boated to Mangalore.

343, SECTION 6—TABULAR STATEMENT OF FELLINGS AND SUBSIDIARY OPERATIONS.

Year.	Marking and climber-cutting.		Timber felling.		Regeneration in gaps.		Tending.	
	Coupe number.	Area in acres.	Coupe number.	Area in acres.	Coupe number.	Area in acres.	Coupe number.	Area in acres.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			Felling Series I.					
1931–32	I	76	..	..	..	..	..	..
1932–33	II	65	I	76	..	..	..	..
1933–34	III	60	II	65	I	76	I	76
1934–35	IV	64	III	60	II	65	I II	76 65
1935–36	V	62	IV	64	III	60	I II III	76 65 60
1936–37	VI	63	V	62	IV	64	II III IV	65 60 64
1937–38	VII	76	VI	63	V	62	III IV V	60 64 62

Year.	Marking and climber cutting.		Timber. felling.		Regeneration in gaps.		Tending.	
	Coupe number.	Area in acres.	Coupe number.	Area in acres.	Coupe number.	Area in acres.	Coupe number.	Area in acres.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

Felling series I—cont.

1938–39	VIII	79	VII	76	VI	63	IV V VI	64 62 63
1939–40	IX	72	VIII	79	VII	76	V VI VII	62 63 76
1940–41	X	70	IX	72	VIII	79	VI VII VIII	63 76 79
1941–42	..	..	X	70	IX	72	VII VIII IX	76 79 72

Felling Series II.

The coupes shall be worked in the serial order marked on the map when and if the series is opened.

Felling Series III.

1931–32	I	60	..	..	..	..	..	..
1932–33	II	52	I	60	..	..	..	..
1933–34	III	56	II	52	I	60	I	60
1934–35	IV	50	III	56	II	52	I II	60 52
1935–36	V	54	IV	50	III	56	I II III	60 52 56
1936–37	VI	55	V	54	IV	50	II III IV	52 56 50
1937–38	VII	62	VI	55	V	54	III IV V	56 50 54
1938–39	VIII	79	VII	62	VI	55	IV V VI	50 54 55
1939–40	IX	78	VIII	79	VII	62	V VI VII	54 55 62
1940–41	X	79	IX	78	VIII	79	VI VII VIII	55 62 79
1941–42	..	..	X	79	IX	78	VII VIII IX	62 79 78

Felling Series IV.

Work in this felling series may not start until 1933–34 as the possibility of getting sufficient Hopea sleepers from the unreserves is being investigated, and at present there are indications that the supply from this source will last for two years.

	I	50	..	..	..	..	..	..
	II	45	I	50	..	..	..	..
	III	30	II	45	I	50	I	50
	IV	30	III	30	II	45	I II	50 45
	V	82	IV	30	III	30	I II III	50 45 30
	VI	34	V	82	IV	30	II III IV	45 30 30
..	VII	48	VI	34	V	82	III IV V	30 30 82
..	VIII	72	VII	48	VI	34	IV V VI	30 82 34
	IX	40	VIII	72	VII	48	V VI VII	82 34 48
	X	40	IX	40	VIII	72	VI VII VIII	34 48 72
			X	40	IX	40	VII VIII IX	48 72 40

SECTION 7.—REGENERATION.

344. Our knowledge of regenerating deciduous timber forests with species other than teak is so limited, that any prescriptions regarding the artificial regeneration of modified light-demanding or shade-bearing timber species under shelterwood, are bound to be of an experimental nature during the first few years, until experience is gained. Reference has already been made in Part I to the fact that no systematic regeneration operations have been undertaken in the past in felled timber coupes and all guidance in this respect is therefore lacking. Therefore the prescriptions hereunder described are of necessity experimental in character and scope. They are however the best that can be proposed at present, and should be followed until experience suggests suitable modifications. Therefore it is incumbent on superior officers to inspect and supervise the operations as frequently as possible. The prescriptions under this section are elastic giving full scope for the management to exercise their discretion to meet the conditions prevailing in each locality.

345. The objects aimed at are—

(1) To regenerate artificially gaps created by the removal of exploitable trees if there is insufficiency of natural regeneration to replace the tree or trees so removed.
(2) To ascertain the best method and the most suitable species for introduction in different localities.
(3) To decide the optimum size of the gaps for each species.
(4) To arrive at the best organization of labour and supervision for an efficient conduct of the operations.
(5) To ascertain the cost of the various regeneration operations.
(6) To determine the intensity and the frequency of tending operations necessary to secure the desired results.
(7) To concert measures to check the spread of Strobilanthes.

346. *Selection and location of gaps.*—On completion of felling a coupe, the District Forest Officer will make a detailed inspection of it and select the gaps to be regenerated artificially subject to the limitations prescribed in the following paragraphs. Already existing gaps, if suitable for regeneration, may also be chosen. Selected gaps will be serially numbered with tar on an adjoining conspicuous tree and the direction of the next gap indicated by an arrow. The position of the gaps will be approximately located on an enlarged plan of the coupe to a scale of 16 inches to a mile. During his inspection the District Forest Officer will make notes regarding the composition and consistency of the ground flora and middle storey in each gap, the size of the gap, and the species he considers suitable for introduction, if natural regeneration is inadequate.

347. *Treatment of gaps.*—No artificial regeneration is indicated in gaps where adequate natural regeneration of utilizable species already exists. For this purpose fifteen healthy seedlings of useful species in a gap of 36′ × 36′ will be considered adequate regeneration. Such gaps will need only tending, which operation shall be carried out simultaneously with tending of the artificially regenerated gaps.

348. Gaps situated in dry deciduous forest shall be regenerated with deciduous species. In moist localities where the undergrowth is of an evergreen character the gaps shall be regenerated with evergreen, shade-bearing or modified light-demanding species. In transitional types the District Forest Officer should exercise his judgment, and decide whether to foster the evergreen ground flora and install evergreen species on it, or to destroy the evergreen conditions and introduce deciduous species.

349. *Nursery.*—The permanent nursery provided for the Clear-felling Working Circle (vide paragraph 392) will be utilized for the supply of the requisite number of stumps and seedlings for planting the gaps in Felling Series I and II.

One permanent nursery consisting of six beds to supply about 3,000 stumps annually shall be maintained in Felling Series III. Instructions regarding the choice and treatment of the nursery site and the subsequent maintenance of the nursery are given in detail under the Clear-felling Working Circle (paragraphs 392-402), which should be referred to.

In Felling Series IV a nursery consisting of three beds, under broken shade of trees, shall be maintained, to supply the requisite number of *Artocarpus hirsuta* stumps for regenerating the gaps, and *Hopea* seedlings for replacing casualties.

Prescriptions for deciduous type.

350. *Size of gaps.*—The minimum size of the gaps selected for artificial treatment shall be 24 feet diameter. Gaps below the minimum prescribed above shall be enlarged by felling trees of inferior species round the gaps.

351. *Clearing of gaps.*—Slash shall be collected and spread evenly over the gap in December. Top ends and branches of trees will be billetted if necessary.

352. *Fire protection.*—The entire coupe shall be fire protected by clearing and burning a line 20 feet wide all round it. It will be done before any burning is performed within the coupe.

353. *Burning the gaps.*—The collected material in the patches shall be burnt in April. Care should be taken that the fire does not escape beyond the gap into the surrounding forest. An even burn should be aimed at. A second burn may be necessary if the first one is inadequate.

354. *Staking and soil preparation.*—Every gap shall be staked at a rough espacement of $4\frac{1}{2}' \times 4\frac{1}{2}'$. Regular aligning and espacement are not necessary; they can be done by eye estimate. The soil adjoining the stakes will be loosened to a depth of 9 to 12 inches and a diameter of $1\frac{1}{2}$ feet in the month of May, and the ash be mixed up with the soil.

355. *Sowing and planting.*—On deep well drained loamy soil one-year old teak stumps shall be planted in the centre of the gap at 50 per cent of the stakes, towards the end of May. *Dalbergia latifolia* shall be dibbled at the remaining stakes. If the soil conditions are unsuitable for teak, seeds of *Terminalia tomentosa, Xylia xylocarpa, Pterocarpus Marsupium, Albizzia odoratissima, Lagerstroemia lanceolata* shall be dibbled in the prepared patches towards the middle of May. The Provincial Silviculturist shall be consulted periodically as to the advisability of using stumps instead of seeds for all species.

Gaps in evergreen or semi-evergreen localities.

356. The general tendency of South Kanara forests is to revert slowly to an evergreen association, and all transitional types occur. With a view to ascertaining whether evergreen conditions are better fostered or prevented, half a dozen gaps containing evergreen ground flora shall be annually treated in the manner prescribed for the deciduous type, and the results carefully recorded. The remainder will be treated as described hereunder, and the two methods subsequently compared. This prescription will apply to Felling Series I to III only, not to Felling Series IV.

357. *Size of gaps.*—The size of a gap shall be no larger than that actually created by the removal of the tree. No widening of the gap by the removal of inferior species is necessary. It often happens that the gap created by the fall of the crown is larger than that actually created around the stump of the tree ; whichever is the case, the larger of the two gaps shall be treated.

358. *Clearing gaps.*—All slash shall be cleared away from the gaps. Strobilanthes, if present, should be cut back below the aerial roots. Low shade should be maintained.

359. *Staking and soil loosening.*—Stakes shall be driven at an approximate espacement of $4\frac{1}{2}' \times 4\frac{1}{2}'$. The staking shall be done in the surrounding forest also to a distance of 5 yards round the margin of the gap. The soil adjoining the stakes shall be loosened in the month of May to a diameter of $1\frac{1}{2}$ feet and a depth of 9 inches.

360. *Sowing and planting.*—Two-year old stumps and six weeks old nursery seedlings of *Artocarpus hirsuta* shall be introduced at 50 per cent of the stakes in the middle of the gap towards the end of May. Sowing may be tried over a few patches, the seeds being buried one or two inches below the surface of the soil, as this is found to minimise damage by vermin. *Hopea parviflora* seed shall be dibbled at the remaining patches, early in June.

361. *Tending common to both the types.*—In evergreen types, weeding the gaps during the first year may not be necessary, if the canopy has not been unduly disturbed. In deciduous patches, provided a good burn has been obtained, the regrowth of weeds should be inconsiderable during the first growing season. In gaps where teak has been installed, at least one clean-weeding must be given. An intensive weeding must be undertaken in all gaps, whether deciduous or evergreen, during the second growing season. A cleaning and climber-cutting will also probably be required in the third year of formation. The necessity for a continuance of tending operations thereafter, and the years in which this should be done, can only be judged after experience has been gained. In order that the gaps shall not be lost sight of subsequently, it is prescribed that the District Forest Officer shall personally inspect each coupe in the fifth year, and provide such treatment as he considers necessary. He will enter all matters of note in the Control Journal. Supervision of these tending operations cannot be effective if a large number of coolies are employed at one and the same time on gaps scattered throughout the coupe. Therefore it is suggested that a guard carefully trained and instructed in his duties should be given special charge of such work, and that he should be given one or two coolies of his own choice for assistance during the four months from August to December every year. The task set should be a reasonable one, which will become evident from experience. As a guide it may be mentioned

that one forest guard assisted by one watcher and one coolie has found no difficulty in keeping weeded 250 gaps in the Wynaad evergreen forests in 1931. The guard will be made responsible under supervision that all regenerated gaps are given the requisite attention. Weekly reports will be submitted by him to the Range Officer and the District Forest Officer stating the number of gaps thus tended. The number of weedings or cleanings necessary will depend upon the nature of the locality and the character of the surrounding flora. The only definite provision made is that weeds shall not be allowed to impede the growth of seedlings, either by overtopping them, or by excessive competition of the roots for moisture.

362. Replacement of casualties shall be done during the first and second growing seasons only, by the use of stumps or transplants. The importance of obtaining a full stocking in the gaps at the end of the first season is emphasized.

363. A soil loosening by the aid of forked mamooties is prescribed in heavy soils where teak has been planted ; this operation should be done in November of the first year.

SECTION 8.—SUPPLEMENTARY SILVICULTURAL REGULATIONS.

364. Climber cutting shall be done at the time of marking. All climbers interfering or likely to interfere with the development of timber trees shall be cut.

365. *Coupe lines.*—Coupe lines shall be cleared to a width of 12 feet at the time of survey of the coupe and they shall be maintained for a period of three years from the year of felling. Permanent maintenance of coupe lines is unnecessary and therefore not prescribed. Wooden boards showing the coupe number, its area and the year of felling, shall be fixed at the corners of each coupe and at junctions with important roads or paths.

366. *Fire protection.*—The ten coupes proposed for felling and regeneration under this plan shall be rigidly fire protected during the period of this plan, by clearing and burning a line 20 feet wide along the periphery of the area. All public rights of way and roads and paths passing through the coupe shall be fire traced to a width of 15 feet.

367. *Grazing.*—Regenerated coupes shall be closed to grazing for a period of seven years from the year of regeneration.

368. *Concessions.*—The exercise of special concessions shall not be permitted in regeneration areas for a period of five years from the year of regeneration.

369. *Regeneration of Hopea.*—Tending natural regeneration of Hopea in the felled coupes of Someshwar reserve shall be done in the order given in the following statement of operations. Some of the gaps in coupes IV, V and VI were sown with teak but the results are reported to be unsatisfactory. In places where teak has failed sowing or planting two-year old stumps of *Artocarpus hirsuta* should be tried. Where teak exists a cleaning shall be carried out as prescribed below :—

Programme of tending operations in Felling series IV.

Block.	Coupe number.	Year of felling.	Year of operation.	Nature of operation.	Remarks.
Someshwar ..	I	1925–26 ..	1933–34 ..	(1) Complete freeing of heads of *Hopea* and *Artocarpus* from weeds to a radius of 3 feet around each plant, and removing creepers. (2) Removal of interfering branches and low shade where necessary. (3) Cutting inspection paths 4 feet wide dividing into sections of about 20 acres.	Special attention to *Artocarpus* saplings.
			1934–35 ..	Nil.	
			1935–36 ..	Climber-cutting by beat guard.	
			1936–37 ..	Inspection by District Forest Officer.	
			1937–38 ..	Further reduction of canopy as ordered by District Forest Officer.	
			1938–41 ..	As ordered by District Forest Officer.	
Someshwar ..	II	1926–27 ..	1933–34 ..	(1) Complete freeing of heads of *Hopea* and *Artocarpus* from weeds to a radius of 3 feet around each plant, and removing creepers. (2) Removal of interfering branches and low shade where necessary. (3) Cutting inspection paths 4 feet wide dividing coupe into sections of about 20 acres.	

Programme of tending operations in Felling series IV—cont.

Block.	Coupe number.	Year of felling.	Year of operation.	Nature of operation.	Remarks.
			1934–35 ..	Nil.	
			1935–36 ..	Climber-cutting by beat guard.	
			1936–37 ..	Inspection by District Forest Officer.	
			1937–38 ..	Further reduction of canopy as ordered by District Forest Officer.	
			1938–41 ..	As ordered by District Forest Officer.	
Someshwar ..	III	1927–28 ..	1934–35 ..	(1) Complete freeing of heads of *Hopea* and *Artocarpus* from weeds to a radius of 3 feet around each plant, and removing creepers. (2) Removal of interfering branches and low shade where necessary. (3) Cutting inspection paths 4 feet wide dividing coupe into sections of about 20 acres.	
			1935–36 ..	Nil.	
			1936–37 ..	Climber-cutting by beat guard.	
			1937–38 ..	Inspection by the District Forest Officer.	
			1938–39 ..	Reduction of low shade as ordered by the District Forest Officer.	
			1939–41 ..	As ordered by the District Forest Officer.	
	IV	1927–28 1928–29	1934–35 ..	(1) Complete freeing of heads of *Hopea* and *Artocarpus* from weeds to a radius of 3 feet all round each plant and removing creepers. (2) Removal of low shade and obstructing branches. (3) Cutting inspection paths 4 feet wide.	
			1935–36 ..	Nil.	
			1936–37 ..	Climber-cutting by beat guard.	
			1937–38 ..	Inspection by the District Forest Officer.	
			1938–39 ..	Reduction of low shade as ordered by the District Forest Officer.	Teak regeneration in gaps to be given a cleaning. Plant or sow *Artocarpus hirsuta* where teak has failed.
			1939–41 ..	As ordered by the District Forest Officer.	
Someshwar ..	V	1928–30 ..	1933–34 ..	Climber-cutting by beat guard.	
			1934–35 ..	Nil.	Teak regeneration in gaps to be given a cleaning. Where teak has failed in the gaps introduce *Artocarpus hirsuta* either by direct sowing or planting two-year old stumps.
			1936–37 ..	(1) Climber-cutting and weeding. (2) Removal of low shade and obstructing branches. (3) Cutting inspection paths 4 feet wide.	
			1937–38 ..	Nil.	
			1938–39 ..	Climber-cutting by beat guard.	
			1939–40 ..	Inspection by the District Forest Officer.	
			1940–41 ..	Reduction of shade as ordered by the District Forest Officer.	
			1941–42 ..	As ordered by the District Forest Officer.	
Someshwar ..	VI	1929–31 ..	1932–33 ..	(1) Cutting back damaged *Hopea* plants. (2) Weeding and climber-cutting. (3) Freeing heads of all *Hopea* and *Artocarpus*. (4) Cutting inspection paths 4 feet wide.	Teak regeneration in gaps to be given a cleaning. Plant stumps of *Artocarpus hirsuta* or sow where teak has failed.
			1933–34 ..	Nil.	Where teak has failed introduce *Artocarpus hirsuta* by sowing or planting two-year old stumps.
			1934–35 ..	Climber-cutting by beat guard.	
			1935–36 ..	Inspection by the District Forest Officer.	
			1936–37 ..	Reduction of low shade as ordered by the District Forest Officer.	
			1937–38 ..	Climber-cutting or as ordered by the District Forest Officer.	
			1938–41 ..	Operations as ordered by the District Forest Officer.	

Programme of tending operations in Felling series IV—cont.

Block.	Coupe number.	Year of felling.	Year of operation.	Nature of operation.	Remarks.
	VII	1930–32 ..	1932–33 ..	(1) Cutting back damaged *Hopea* plants. (2) Weeding and climber-cutting. (3) Freeing heads of all Hopea and *Artocarpus*. (4) Cutting inspection paths four feet wide.	
			1933–34 ..	Nil.	
			1934–35 ..	Climber-cutting by beat guard.	
			1935–36 ..	Inspection by the District Forest Officer.	
			1936–37 ..	Reduction of low shade as ordered by the District Forest Officer.	
			1937–38 ..	Climber-cutting and tending as ordered by the District Forest Officer.	
			1938–41 ..	Operations as ordered by the District Forest Officer.	

SECTION 9—CONTROL.

370. The District Forest Officer will be personally responsible for the correct maintenance of the following control records :—

The Control Book, The Control Journal and
The Regeneration Ledger, The Control Map.

Sample entries of Control Book and Regeneration Ledger are given in Appendix II. The Control Journal shall be taken into camp by the District Forest Officer and he shall record any useful observations he may make in the field.

The Control Map shall be maintained on a scale of 4 inches to one mile wherein all coupes felled and regenerated shall be posted, as well as such other suitable items as may be advisable.

CHAPTER III.—WORKING PLAN FOR THE CLEAR-FELLING EXPERIMENTAL WORKING CIRCLE.

SECTION 1.—GENERAL CONSTITUTION OF THE CIRCLE AND CHARACTER OF THE VEGETATION.

371. The object of this working circle being principally to experiment with the artificial introduction of teak and other deciduous species in clear-felled areas under different methods of formation, no attempt has been made to allocate areas for one complete rotation. The prescriptions contained herein are elastic, allowing ample discretion to the management to revise, modify or amplify them in the light of experience gained during the first few years of working. The area chosen for regeneration during the period of this plan is only 200 acres, divided into ten annual coupes of 20 acres each. At the end of the ten-year period a great deal of experience in methods of regeneration after clear-felling, as well as ample data regarding cost of formation, suitability of species to varying conditions of soil, and organization of works, will have been collected. The next revising officer will consider the advisability of continuing these concentrated regeneration operations, and will suggest further areas for regeneration if the results achieved are satisfactory.

372. The character of the vegetation in this working circle is transitional, between dry and moist deciduous types. The soil consists of a deep, brownish, friable loam rich with humus and undecomposed vegetable matter. The slope is gentle and drainage good. The aspect is easterly. The distribution of utilizable tree species is very varied ; in timber areas the growth consists principally of *Lagerstroemia lanceolata, Terminalia paniculata* and their usual associates. Mature trees are occasionally found and the height of principal species is about 60 feet, indicative of a fairly deep soil. In non-timber areas the vegetation chiefly consists of soft-wooded deciduous species with a dense mass of thorny climbers or evergreen shrubs. These sparsely timbered areas are most probably the result of past kumri.

SECTION 2.—BLOCKS AND COMPARTMENTS.

373. No permanent blocks or compartments have been formed. Each year's plantation shall be given a number in serial order and boards shall be put up at the corners of each plantation indicating the coupe number, its area and the year of formation.

SECTION 3.—ANALYSIS AND VALUATION OF THE CROP.

374. Enumerations were done over 12·64 acres, in strips one chain on either side of lines passing through the timber areas, and the results are given below :—

Species enumerated.	Girth classes. 3′–4′ NO.	C.FT.	4′–5′ NO.	C.FT.	5′–6′ NO.	C.FT.	6′–7′ NO.	C.FT.	7′–8′ NO.	C.FT.	Over 8′ NO.	C.FT.	Total. NO.	C.FT.
Terminalia paniculata ..	11	196	10	317	9	524	8	593	..	..	..	..	38	1,630
Lagerstroemia lanceolata.	30	593	34	1,412	18	1,237	8	898	4	563	7	1,430	101	6,133
Vitex altissima	2	42	5	133	..	..	1	26	..	..	..	..	8	201
Dalbergia latifolia ..	..	..	1	32	..	..	..	..	..	..	..	..	1	32
Artocarpus lakoocha ..	1	23	..	..	..	..	1	119	..	..	1	248	3	390
Lagerstroemia Flos Reginae.	1	15	2	89	..	..	..	..	..	..	..	..	3	104
Eugenia jambolana ..	..	..	..	..	..	..	..	..	..	..	1	281	1	281
Total ..	**45**	**869**	**52**	**1,983**	**27**	**1,761**	**18**	**1,636**	**4**	**563**	**9**	**1,959**	**155**	**8,771**

SECTION 4.—METHOD OF TREATMENT.

375. The *silvicultural system* will consist of clear-felling, and regenerating the area felled artificially with utilizable deciduous species.

376. The *exploitable size* will largely depend upon market requirements ; anything which can be marketted at a profit may be extracted.

377. The *yield* will be regulated by area. The objects of this working circle being chiefly experimental, the yield obtainable from it is of minor importance. No yield of saleable timber is expected from the non-timber areas and so none is provided for. The yield from timber areas is calculated from the results of enumerations. The following table shows the expected gross yield of timber of present utility species from each coupe :—

Coupe number.	Area in acres.	Expected gross yield. Lagerstroemia lanceolata. NO.	C.FT.	Terminalia paniculata. NO.	C.FT.	Total. NO.	C.FT.
I	20	114	8,860	44	2,280	158	11,140
II	20	114	8,860	44	2,280	158	11,140
III	20	96	7,531	37	2,038	133	9,569
IV	20	74	5,759	28	1,482	102	7,241
V	20	23	1,772	10	456	33	2,228
VI	20	6	442	2	114	8	557
VII	20	23	1,772	10	456	33	2,228
VIII	20	51	3,987	20	1,026	71	5,013
IX	20	108	8,417	41	2,166	149	10,583
X	20	62	4,873	25	1,254	87	6,127
Total ..	**200**	**671**	**52,274**	**261**	**13,552**	**932**	**65,826**

In the above statement trees of and above four feet in girth at breast-height only have been reckoned.

378. *Kumri cultivation.*—Kumri consists in the formation of plantations along with field crops on newly burnt forest areas. Extraction of marketable timber from each annual coupe shall be done departmentally.

There are about fifteen families of Kudubies living in " Mavinkar " enclosure which is close to this working circle, who are eager to take up land for kumri cultivation in the areas proposed for regeneration during the period of this plan. The Kudubies agree to do the clear-felling, burning and tending the seedlings in the year of formation free of cost in return for their being permitted to raise a crop of ragi in the clear-felled area during the first year. Each annual coupe shall be roughly divided into two-acre blocks and one block shall be assigned to each family headman and necessary agreements executed with him by the District Forest Officer. Should there be no demand for kumri cultivation all the operations prescribed herein shall be carried out departmentally. If the work is done by kumri the forest operations, except clear-felling, burning and weeding in the first year, will all be paid for and done under departmental supervision.

SECTION 5.—EXPLOITATION.

379. The annual coupe will be surveyed by the Range Officer and demarcated by a cut line six feet wide all round it in January of the year preceding felling.

380. *Marking.*—Before marking is commenced the District Forest Officer shall communicate to the Range Officer the girth limits of the species to be marked for extraction, which will be determined by market requirements. Marking will be done by the Range Officer in March-April. Exploitable trees will be blazed and numbered serially with tar-

at two places, one at breast-height and the other as close to the ground on the trunk as possible. The breast-height girth of each marked tree and the estimated length of its merchantable bole shall be entered in the appropriate columns of Form 3. A reduction factor of 0·6 may tentatively be adopted to estimate the outturn of timber after felling and conversion. The use of the volume tables in Chapter VI of Part I may also be resorted to as a check but at present it is recommended that they should be used with reserve for reasons already referred to.

381. Timber-felling shall be completed by the end of August.

382. Felling unmarketable species will be done by kumri cultivators, if any are willing to undertake the work, as prescribed above ; in case there is no demand for kumri cultivation in any particular year, this operation shall be done departmentally. Clear-felling shall be completed by the end of December. It is important that this operation be done early enough to allow the cut material and slash to dry well before the commencement of burning during the hot weather. Strobilanthes shall be cut back below the collum.

383. A *fire line* 20 feet wide shall be cut all round the coupe in January. Two guide lines each five feet wide shall be cut and the material put in the central belt and burnt towards the end of February before commencement of burning the coupe.

384. *Burning.*—The desirability of obtaining a good uniform burn over the entire coupe cannot be over-emphasised. Provided a good uniform burn had been obtained the resulting weed growth in the area will be considerably minimised and the cost of formation will be proprotionately less. Where a log has been consumed by fire the product consists of an accumulation of white ash over a charred soil, which is invariably detrimental to the proper development of planted seedlings. In such instances the ash should be well mixed up with the soil before actual planting or sowing is done. Burning should be done towards the end of February or at the latest, early in March. A second burn may be necessary if the first one is not successful. It is not necessary that every big log should be burnt. During the second burning small logs and unburnt ends shall be billetted and stacked uniformly over patches, which were not satisfactorily burnt in the first instance, and reburnt. If the annual coupes are handed over to kumridars they shall do the burning under the supervision of the Range Officer.

385. SECTION 6.—TABULAR STATEMENT OF FELLINGS AND SUBSIDIARY OPERATIONS.

Year.	Nature of operations.											
	Timber. extraction.		Clear felling.		Regeneration.		Replacing casualities.		Tending.		Cleaning and climber-cutting.	
	Coupe number.	Area in acres.	Coupe number.	Area in acres.	Coupe number.	Area in acres.	Coupe number.	Area in acres.	Coupe number.	Area in acres.	Coupe number.	Area in acres.
1932–33	I	20	I	20	..	..	..	..	..	..	..	..
1933–34	II	20	II	20	I	20	I	20	I	20	..	..
1934–35	III	20	III	20	II	20	I II	20 20	I II	20 20	..	..
1935–36	IV	20	IV	20	III	20	II III	20 20	I II III	20 20 20	I	20
1936–37	V	20	V	20	IV	20	III IV	20 20	II III IV	20 20 20	II	20
1937–38	VI	20	VI	20	V	20	IV V	20 20	III IV V	20 20 20	III	20
1938–39	VII	20	VII	20	VI	20	V VI	20 20	IV V VI	20 20 20	IV	20
1939–40	VIII	20	VIII	20	VII	20	VI VII	20 20	V VI VII	20 20 20	V	20
1940–41	IX	20	IX	20	VIII	20	VII VIII	20 20	VI VII VIII	20 20 20	VI	20
1941–42	X	20	X	20	IX	20	VIII IX	20 20	VII VIII IX	20 20 20	VII	20

At the time of the next revision, provision should be made for regenerating coupe X, replacing casualties in coupes IX and X, tending, cleaning and climber-cutting in coupes VIII, IX and X.

SECTION 7.—SEED COLLECTION AND NURSERY.

386. *Teak.*—Annual requirements of teak seeds can be obtained from the District Forest Officer, South Mangalore, or from the Nilambur or Wynaad Divisions.

One bag of teak seeds weighs about 60 pounds and contains approximately 48,00C seeds. For every bag of teak seeds as picked from the ground, two-thirds of a bag of selected seeds can be obtained. One-third of a bag of selected teak seeds would be required to sow broadcast a nursery bed 40′ × 4′, which will produce roughly 4,000 seedlings. During selection of seed prior to sowing, small and undersized seeds should be discarded and only the largest seed retained.

387. *Dalbergia latifolia* does not seed freely every year ; but, the quantity required annually being small, it can be found within the district itself. The seeds take a long time to ripen in the pod, and so care should be taken to collect only ripe seeds. They should not be removed from the pods till they are required for sowing.

388. *Pterocarpus marsupium* fruits ripen from December to April and seeds can be collected in the latter month. The whole fruit should be sown.

389. *Terminalia tomentosa* seeds ripen in February-March and the ripe seeds fall from the trees from March to May. To obtain satisfactory germination the seeds should be collected as late in the season as possible, so as to eliminate infertile seeds. Seeds should not be completely buried in the soil when sown.

390. *Artocarpus hirsuta.*—The fruit ripens in May or June. The seed will keep only for a few days. Entire fruits should be collected from the trees and the seeds should be removed from the fruits only at the time of sowing. As an experimental measure, some of these seeds should be sown 1 or 2 inches below the surface of the soil as this tends to prevent both the seed and the cotyledons from being eaten by vermin.

391. *Albizzia lebbek* pods should be collected from the tree itself or from the ground when they are freshly fallen. The seed keeps well till the rains.

392. *Nursery.*—A permanent nursery site 150′ × 120′, in a convenient locality on the bank of the Kolluru river, and as far as possible centrally situated for all the ten coupes, should be personally selected by the District Forest Officer. All overhead shade should be completely removed, and trees all round the site to a distance of 15 yards should be girdled or felled. The nursery site shall be on a well-drained, deep loamy soil.

393. The following estimate as to the number of nursery beds that will be required is based on the assumption that the whole coupe of 20 acres may, at some time or other, be required to be planted up entirely with one year old stumps. The total number of stumps that would be required for original planting over 20 acres, at an espacement of 6′ × 6′ would be 20 × 1,210 or 24,200. A transplant bed 40′ × 4′ will take 640 seedlings at an espacement of 6″ × 6″. Thirty-eight transplant beds will be required for producing the necessary stumps for original planting. Reckoning the percentage of casualties to be replaced in the first and second years at 30, eleven transplant beds would be required for this in addition. Each seed bed will produce at least 3,200 healthy seedlings fit for pricking out in the nursery. One seed bed will be required for every five transplant beds. Therefore for 49 transplant beds, ten seed beds will be required. On the whole 59 or say 60 beds would be needed to regenerate the annual coupe with one year old stumps, including replacement of casualties in the first two years. Provision is therefore made for this maximum requirement. The possibility of producing the necessary number of stumps from a smaller nursery is, however, referred to below.

394. The nursery site shall be dug up to a depth of 1½ feet and all stumps, boulders and roots shall be removed from the soil. The top layer of the soil should be kept separate and spread over the nursery beds after they are formed finally. The level of the formed beds should be about 6 to 9 inches above the surrounding ground and the sides of the beds should be revetted with split bamboos.

395. The nursery beds shall be arranged in three rows of twenty beds each, the length of the beds lying along the contours. A path 1½ feet wide shall be allowed on all sides of each bed. The nursery site should be strongly fenced with stout wooden posts and split bamboos. Drainage should be provided to remove surplus water during the rains.

396. The seed beds shall be sown in the second week of May. Teak seeds should be soaked in cold water for 48 hours before sowing. The seeds should be sown broad cast and covered with a thin layer of soil. Small bamboo splits will be laid across the nursery beds, over which a thin layer of straw will be spread to retain moisture in the soil. Light branches will be placed over the straw to prevent its being blown off.

397. During the *short* period after sowing until the preliminary showers of the south-west monsoon are received, artificial watering of the seed beds *may* be necessary but watering is to be done only if it is essential and no watering will be required after the monsoon. If watering in the early stages is desirable the possibility of diverting water from higher up the Kolluru river to the nursery site should be examined. Split bamboo or *Areca* palm troughs may be used for diverting the water. If such irrigation is impossible watering can be done by the subordinate in direct charge of the nursery. It should be done only in the mornings, preferably from tin cans with a rose attachment and must not be done more than two or three times a week.

398. In two to three weeks after sowing there will be copious germination. When the teak seedlings in the seed beds have developed two to three pairs of leaves, a sufficient number of them should be transferred to transplant beds at an espacement of 6″ × 6″. Care should be taken not to injure the roots of the seedlings while transplanting. Leaves of transplanted seedlings can be partially clipped to reduce excessive transpiration. Transplanting should be done on a rainy day. The object of pricking out in the nursery is to promote the development of thick carrot-like roots ; but its advisability is, from other points of view, such as cost, survival of seedlings and so on, not universally accepted.

399. In Travancore, where the formation of plantations by stump-planting has been the chief method employed for many years, seedlings are not pricked out, but are allowed to grow in the original seed beds until they are big enough for stumping—vide Chief Conservator's Proceedings No. 321, Press, dated 12th October 1928. This method will also be tried here, and the Provincial Silviculturist must be frequently consulted as to any developments that may have taken place.

400. A forest guard will be specially entrusted with the protection and tending of the nursery. The nursery beds should always be kept absolutely clear of weeds, and the soil constantly worked up. Weeding and soil working are as important as watering. Certain *Melanonthidæ larvæ* are known to attack the roots of nursery seedlings of teak in other districts ; the attacked seedlings wilt and die. If cases of such attacks are noticed in the nursery, the attacked seedlings should be pulled out and the grubs destroyed. A possible preventive measure against defoliators is to strew the nursery beds with ash.

401. The District Forest Officer should inspect the nursery as frequently as possible when he camps in the neighbourhood and satisfy himself that it is maintained on the lines prescribed above. Every effort should be made to obtain healthy thrifty plants in the nursery, as on this largely depends the success of the plantations.

402. When the nursery is finally abandoned a sufficient number of healthy, well-grown seedlings of suitable species must be left in it 6 feet apart.

SECTION 8.—PLANTING PLAN.

403. The annual coupe shall be inspected by the District Forest Officer before it is clear-felled, and he shall record notes regarding soil, aspect, drainage, character and composition of the vegetation, height growth of principal species and any other relevant information that may be of interest to future management, in the Regeneration Ledger. He shall also note down, on an enlarged plan of the area to a scale of 16 inches to 1 mile, the general arrangements for regeneration operations, the areas proposed to be regenerated with each species, whether by sowing or planting seedlings or stumps, and the lay out of inspection paths, etc. A copy of this plan with a copy of the notes of the District Forest Officer shall be submitted to the Conservator of the Circle well in advance for his approval.

SECTION 9.—REGENERATION.

404. *Preparation of the area.*—Two inspection paths each 6 feet wide and intersecting at right angles in the middle of the coupe shall be laid out, dividing the coupe into four parts of approximately five acres each. The inspection paths will serve as suitable base lines at the time of aligning and staking.

405. The espacement will be 6′ × 6′. Instructions regarding aligning and staking are contained on pages 40 to 43 of the Madras Forest Pocket Book which should be consulted. Split bamboo or wooden stakes will be used to indicate the patches. The stakes should be driven firmly into the ground, and at the time of every tending operation missing stakes must be replaced, and those which are loose tightened.

406. Preparation of patches shall be done as soon as aligning and staking are completed. The soil adjoining each stake shall be loosened to a diameter of 1½ feet and a depth of 12 inches, turned over and allowed to weather before actual planting is done.

407. *Methods of formation.*—The following methods shall be tried :—

(1) Direct sowing,
(2) Notching germinating seeds direct into the regeneration area,
(3) Planting six-weeks old nursery seedlings,
(4) Planting one-year old stumps from transplant beds, and
(5) Planting one-year old stumps direct from the seed beds (Travancore method).

In the light of knowledge acquired during the first few years the management should decide on the best and most reasonably economical method of formation.

408. *Choice of species.*—The species recommended to be introduced are teak, *Terminalia tomentosa, Dalbergia latifolia, Pterocarpus marsupium, Albizzia lebbek* and *Artocarpus hirsuta.*

409. Teak shall be introduced in all localities where it can grow with reasonable chances of success. Deep, well-drained, loamy soil is ordinarily suited to this species. Most of the area of this working circle appears to be suitable for the introduction of teak.

410. *Dalbergia latifolia* and *Pterocarpus marsupium* can be introduced with advantage either in mixture with teak or separately on moderately deep, bouldery soils.

411. *Artocarpus hirsuta* should be tried experimentally in protected moist localities containing fairly deep loamy soil but laterite, if not too advanced, is not unsuitable.

412. Low-lying, ill-drained localities can be regenerated with *Terminalia tomentosa* ; *Albizzia lebbek* can be introduced in dry localities.

413. It should be remembered that the object is not to form pure teak plantations ; on the contrary a suitable stem or perferably group mixture is to be aimed at. Third-quality teak is more remunerative as a crop than one of any other deciduous species, and so extra expenditure incurred in establishing a plantation with a high proportion of teak is justifiable. Every endeavour should be made to obtain as full a stocking of deciduous species in the coupe in the quickest possible time at minimum expense. It is recommended that a proportion of 75 per cent of the area be regenerated with teak, 15 per cent with *Dalbergia latifolia* and *Pterocarpus marsupium*, and the remaining 10 per cent with other species.

414. *Sowing and planting.*—Methods of dealing with individual species are dealt with below. Several different methods are outlined for trial in the first instance. Note will be made of the cheapest and most effective procedure and when experience is gained, the management will adopt it subsequently.

415. *I. Teak.*—Direct sowing will be limited to one acre of each annual coupe ; 10 to 12 selected teak seeds will be dibbled at each prepared patch in the second week of April. The seeds should not be buried more than one-third of an inch below the surface.

416. Notching of germinating seeds from dumps directly into the planting area, shall be done immediately the south-west monsoon bursts. One dump of teak seeds should be put out in the area to be notched in the month of March. The dump should be about four inches thick. The seeds will begin to germinate with the first rains of the monsoon, and when the cotyledons have emerged and turned green the seeds should be notched into the planting area. Two or three small holes each about half an inch deep shall be made in the prepared patches, and one germinating seed inserted in each hole and gently covered with earth and the sides of the hole pressed in with the fingers. Not more than one acre of the coupe shall be regenerated by this method.

417. The planting of six weeks old nursery seedlings shall also be done directly the monsoon bursts. Not more than one acre in any coupe shall be tried under this method. A speedy completion of planting work is all-essential, as a continuance of favourable weather for at least two days after the plants are put out is necessary for success. Seedlings from the nursery will be carefully uprooted and transferred in baskets to the planting area with minimum damage to the roots. Actual planting shall be done on a rainy day. Holes shall be made in the prepared patches with a pointed stick and one seedling inserted in each patch. The depth of the hole should be exactly the same as the length of the tap root, and the sides of the hole should be well pressed in. Unless closely supervised the coolies are liable to commit mistakes in planting. The success of a plantation depends to a great extent on the care taken at the time of planting; and the prevalence of favourable weather after planting.

418. *Stump planting.*—The greater part of the coupe will be regenerated by means of teak stumps. One-year old teak transplants and one-year old seedlings from the nursery should be dug up and stumped, leaving one to one and a half inches of stem and nine inches of tap root. The most appropriate size for a stump is generally considered to be the thickness of a lead pencil, but this point has not yet been definitely established. Stumping should be done with a sharp knife so as to leave a clean slanting cut. Side roots should be pruned off close to the tap root. The stumps shall be transported to the planting area, where they shall be put out in holes made in the prepared patches. The following instructions should be carefully observed in stump planting operations :—

(1) The collum of the stump should be on a level with the surface of the ground.

(2) The depth of the hole should be exactly equal to the length of the tap root. Disregard of this essential is likely to result in the death of the stump owing to an accumulation of water in the interspaces between the root and the bottom of the hole.

(3) The holes should be firmly closed so as not to allow any interspaces around the root. The correct way to do this is to drive a crowbar or stick in, in a slanting direction, 4 to 5 inches from the hole and close it by directing pressure towards the plant.

(4) The stumps should be firmly fixed and should be fairly resistant to a hard pull, when alone they can be considered to have been satisfactorily planted.

419. Stumps from both transplants and seedlings should be used, in separate areas, which should be clearly differentiated, so that the more successful method to use in South Kanara may be determined.

420. Stump planting should be done as early in the month of May as the ground is sufficiently moist. All available labour should be employed on the day proposed for planting and the work should be completed without delay.

421. *II. Dalbergia latifolia.*—Direct sowings give satisfactory results and this should be the normal method. Planting one-year old stumps is reputed also to give success and may be tried on a small area.

422. *III. Pterocarpus marsupium.*—Direct sowings in prepared patches have proved efficacious. About 12 seeds should be sown in each prepared patch in the month of May and lightly covered with earth. One year old stumps also give satisfactory results. Both methods should be tried on a small scale. Four planting rows along the periphery of the regeneration area shall be regenerated with *Dalbergia latifolia* and *Pterocarpus marsupium* at alternate stakes. Also the Mount Stuart method of sowing *Dalbergia latifolia* and *Pterocarpus marsupium* seeds along with teak at stakes should be tried for the first five years in all areas where teak is sown. The object is to encourage a suitable mixture. If the results are successful, this should be continued as a permanent measure.

423. *IV. Terminalia tomentosa.*—No attempt should be made to grow this species in admixture with teak as it is likely to overtake the teak in the pole stage. *Terminalia tomentosa* should be confined to low-lying, ill-drained localities where other species will not thrive.

424. *V. Artocarpus hirsuta.*—Direct sowings and planting two-year old stumps are found to be fairly successful and these should be tried. The seed should be sown as soon as possible after collection from the trees, and should not be removed from the fruits till required for sowing. Direct sowing is successful if the seeds escape attack by vermin. Sowing one or two inches below the surface of the soil will sometimes ensure this. If casualties after sowing are numerous, two-year old stumps should be prepared from seedlings raised in the nursery. The Provincial Silviculturist should be further consulted as to the best means of raising this species.

425. *VI. Albizzia lebbek.*—Direct sowing in the second week of April is known to give satisfactory results and should be tried. Stump planting is also successful. Fifteen months old stumps should be used. Both sowing and stump planting should be tried over a small area.

SECTION 10.—SUBSIDIARY SILVICULTURAL REGULATIONS.

426. *Weeding.*—A good burn in the first instance will impede the regrowth of weeds to a great extent during the first season. Climatic conditions in South Kanara, however, accelerate the growth of weeds and climbers, which menace all clear-felled areas. In the absence of any experience in tending plantations of deciduous species in this division, it is not possible to prescribe definitely the number of weedings that will be necessary until the plantation is fully established and out of danger. A rough estimate will be to have three weedings in the first year and two weedings in each of the following two years. Subsequent weedings, if found necessary, are left to the discretion of the management. As a general rule a weeding shall be done as often as necessary.

427. If the annual coupe is given for kumri the kumridars should do the first two weedings in the first year *free of cost.* A certain amount of reluctance in removing mature ragi crop interfering with the planted seedlings, is likely to be displayed by the kumridars, but the executive staff shall see, right from the beginning, that the seedlings are kept free from the surrounding crop.

428. In coupes not handed over to kumridars all the weedings shall be done departmentally.

429. A first weeding shall be done in the month of August when there is a break in the monsoon.

430. In areas handed over to kumri this operation will consist in loosening the soil to a distance of two feet all round the plants and to a depth of three to four inches with forks and of pulling out the weeds by hand, great care being taken not to disturb the young plants.

431. In non-kumried areas the first weeding shall be a clear weeding with forked mammooties in strips two feet wide on either side of the planted rows, again great care being taken not to disturb the young plants. The soil along the strips will be loosened to a depth of three to four inches and all weeds shall be eradicated and heaped in the unweeded strips. Spontaneous growth of useful species shall be left, unless it directly interferes with the planted crops.

432. A second weeding shall be done in the month of October and will be on the lines prescribed above, but the lines should be at right angles to those weeded in the first instance.

433. Areas given to kumri shall be relinquished by the kumridars in November or December after they have harvested their crops.

434. A third weeding and soil working shall be done over the entire plantation area towards the end of November or early in December. This opertaion shall be a clean weeding combined with soil working by forking in strips to a distance of two feet on either side of the planted rows. This shall be done thoroughly.

435. In the second and third years two weedings each year may be necessary, of which the first one will consist of weed cutting along lines two feet wide on either side of the planted rows in the month of July-August. The second weeding may be done in October-November. Soil loosening shall be done around backward plants.

436. *Replacement of casualties.*—In directly sown areas, casualties in the first year shall be replaced in the month of July either from excess seedlings found at the other patches or from germinating seeds from dumps. Casualties in the second year shall be replaced by stumps.

In areas planted with nursery seedlings or one-year old stumps casualties in the first and second years shall be replaced by stumps only.

Every endeavour should be made to secure a full stocking of seedlings in the coupe during the first year. No replacement of casualities is prescribed after the second year.

437. *Mixture.*—Natural seedlings of *Lagerstrœmia lanceolata, Terminalia paniculata, Dalbergia latifolia, Xylia xylocarpa* and *Terminalia tomentosa* often spring up in freshly cleared areas, and such growth should be fostered in order to keep down weed-growth and also to form a mixture with teak, which is most desirable.

438. *Cleaning.*—Fast growing and soft wooded species such as, *Macaranga roxburghii, Trema orientalis, Grewia laviaegata, Mallotus alba* and *Mallotus Phillipinensis* readily occupy freshly cleared areas, to the detriment of excessive light-demanding species such as teak. A cleaning to consist of cutting back such inferior species over teak combined with a creeper cutting, shall be done in the fourth year and repeated later, whenever the District Forest Officer, after inspection, considers it necessary. The object of this cleaning is to maintain the heads of planted seedlings from interfereing growth. To avoid unnecessarily exposing the soil, and in order to prevent the teak from developing epicormic branches, such species may be pollarded instead of being cut right back, if they will respond to this operation. Bamboo regrowth must be cut down to the ground directly it appears and must be kept down.

439. *Thinning.*—No thinnings will be necessary during the period of this plan.

440. *Fire protection.*—All plantations formed during the period of the plan in this working circle shall be rigidly fire protected by clearing and burning a line 20 feet wide along the periphery of the plantations where it adjoins a natural forest. Two guide lines 5 feet wide each shall be cleared and the central belt burnt together with the cut material. Internal coupe lines shall be fire-traced to a width of 10 feet.

441. *Grazing.*—All plantations formed in this working circle shall be closed to grazing during the period of the plan.

442. *Concessions.*—The excercise of the special concessions for South Kanara shall not be allowed in the plantations.

443. *General.*—The experimental nature of the operations prescribed for this working circle necessitates accurate costing and supervision by the District Forest Officer and his staff.

SECTION 11.—CONTROL.

444. The following control records shall be maintained by the District Forest Officer who will be personally responsible for their correct posting :—

The Control Book,
The Regeneration Ledger,
The Nursery Ledger,
The Control Journal, and
The Control Map.

The Control Book.—This will be a record containing the felling prescriptions of the working plan, the felling works actually carried out and the yield obtained. A sample form is given in Appendix II.

Regeneration Ledger.—A sample form is given in Appendix II. All operations prescribed and carried out in this working circle with regard to regeneration shall be recorded in the Regeneration Ledger.

Nursery Ledger.—A separate ledger for the creation and maintenance of the permanent nursery is prescribed. A sample form is given in Appendix II.

The Control Journal.—All information of interest, especially with a view to assisting future working plans officers, should be recorded in the Control Journal by the District Forest Officer.

The Control Map.—A plan shall be maintained on a scale of 16 inches to 1 mile showing the area felled annually, the area regenerated and the localities wherein different species or methods of formation have been introduced. Every such area should be separately surveyed and the results conveyed to the Control Map.

CHAPTER IV.—WORKING PLAN FOR THE PLANTATION WORKING CIRCLE.

SECTION 1.—CONSTITUTION OF THE WORKING CIRCLE AND CHARACTER OF THE VEGETATION.

445. This working circle, which covers a total extent of 3,793 acres, comprises all regular plantations of *Hopea parviflora* and other evergreen species which have been formed in Udipi Range prior to the inception of this working plan, but it does not include coupes in Someshwar reserve which have been worked for the production of *Hopea* sleepers wherein artificial measures have been used to supplement natural regeneration of *Hopea* already on the ground. The areas in this working circle contained originally no *Hopea* seed-bearers except in narrow strips along stream-margins, and the young crops are accordingly even-aged throughout. All plantations have been formed during the years 1920–28.

446. The vegetation is fairly uniform in these plantations, being predominantly moist deciduous in character. The overwood contains trees of deciduous species, chiefly *Terminalia tomentosa, Terminalia paniculata, Terminalia belerica, Lagerstrœmia lanceolata, Xylia xylocarpa*, etc., with an admixture of others characteristic of moist zones such as *Vitex altissima, Calophyllum wightianum, Spondias mangifera, Lophopetalum wightianum, Mangifera indica. Hopea parviflora* and *Hopea wightianum* are found near streams. Bamboo flowered in 1920 and regeneration is found in the more open localities. A well-advanced middle storey of smaller evergreen trees, such as *Aporosa lindleyana, Elæocarpus serratus, Olea dioica, Ixora species*, etc. (but predominantly of the first-named species), is evident. In a few localities *Aporosa* forms practically the only canopy, there being no overwood of larger trees. Undergrowth consists of *Webera canarica, Memecylon malabaricum, Psychotria truncata, Olea dioica, Limonia acidissima*, Strobilanthes and *Leea sambucina*. Strobilanthes forms a dense thicket in many semi-open patches and is in greater abundance generally than in South Mangalore Division. *Leea* has in certain localities with deeper soils grown to considerable height and appears to have impeded the growth of *Hopea* seedlings. Climbers abound in many parts and are detrimental to tree-growth.

The overwood rarely contains trees of exploitable dimensions. In Halesomeshwar reserve, trees of timber species over 4 feet 6 inches girth at breast-height were extracted in the years 1920–24. In Jatkatmale and Someshwar plantations, the deciduous timber crop is as a rule poor in quality and of stunted growth-habit. Some soft-wooded trees have been girdled in the course of tending operations in order to admit more light to the young crop, but the evergreen middle storey is often dense and requires thinning out.

447. The Hopea crop has been formed at various espacements. The first plantations were at 27′ × 27′; subsequently the espacement was reduced to 13½′ × 13½′ and 12′ × 12′. The operations have met with very fair success on the whole;

abandoned areas (which are shown on the plantation maps prepared for this working circle) are few. Previous trial enumerations made in 1928, showed between 65 and 85 per cent success. The crop possesses a rather variable state of advancement and height ranges from 1 foot to 14 feet, the average being 5-6 feet. These discrepancies will of course tend to disappear in time. Moist, semi-open patches where the *Hopea* was sown under bushes and small trees, show often the best and sturdiest individuals, greatly in advance of those sown contemporaneously under deeper shade. The crop as a whole appears to be retarded by too heavy a conopy, especially by low overhanging branches. The large areas sown annually have been rather excessive for the executive staff to cope with subsequently, and the degree of tending has been less than desirable. For this reason the plantations will not be extended during the period of this plan, but every effort will be made to tend, and improve the condition of the existing crop.

SECTION 2.—DIVISION OF THE AREA.

448. Plantations will be denoted by the name of the block or reserve in which they are situated, and the year of formation, e.g., "Jatkatmale, 1920–21." This will obviate the confusion which may arise from the present nomenclature of "bits" and "coupes," except that where two different localities in the same reserve were formed in the same year, the terms "Bit I" and "Bit II" are retained to differentiate them; e.g., "Jatkatmale, 1920–21—Bit II" represents one of the two separate portions which were sown in 1920–21. Further subdivision of the area is unnecessary.

SECTION 3.—ANALYSIS AND VALUATION OF THE CROP.

449. It is unnecessary to evaluate the older crop constituting the overwood, since this is of irregular character and now of secondary importance. It will be progressively removed in the course of silvicultural operations to benefit the young crop. The costs of formation and tending of the several plantations up to the end of 1928–29 were respectively as follows :—

Statement showing the Hopea plantations in North Mangalore Division and their costs of formation and tending.

Reserved Forest.	Year of formation.	Area re-generated in acres.	Cost of formation.	Cost of tending.	Total cost (excluding over-heads).	Total cost per acre (excluding overheads).	Total cost (including overheads and 3 per cent compound interest).	Total cost per acre (including overheads and 3 per cent compound interest).	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			R. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	
Jatkatmale Bit I	1920–21	189·40	659 5 8	872 7 0	1,157 0 5	9 5 4	2,747 3 6	19 11 9	Bit I (65 acres) was abandoned and Rs. 374–10–3 written off in 1923–24. Total cost refers to Bit I, 124·4 acres only.
Jatkatmale Bits I, II and III.	1921–22	658·00	1,203 7 0	3,146 10 9	3,987 1 6	6 15 9	7,636 13 9	13 6 0	Bit II (87 acres) was abandoned and Rs. 363–15–3 written off in 1923–24. Total cost refers to Bits I and III, 571 acres only.
Jatkatmale Bit IV.	1922–23	443·70	1,086 14 8	2,051 7 6	3,138 6 2	7 1 1	5,364 12 6	12 1 5	
Old Someshwar (Coupes I, II and part of VI).	1922–23	524·00	2,329 8 9	2,137 9 0	4,467 1 9	8 8 6	5,998 9 3	11 7 2	This area which was originally sown 27′ × 27′ was resown at an espacement of 9′ × 9′ in 1928–29 in 1929–30.
Old Someshwar (Coupes III, IV and V).	1923–24 and 1924–25.	545·00	2,050 6 0	1,053 15 0	3,104 5 0	5 11 2	5,255 11 7	9 10 4	
Old Someshwar (Coupes VII, VIII and part of VI).	1925–26 and 1926–27.	774·00	2,787 3 0	1,156 4 0	3,943 7 0	5 1 6	6,395 6 4	8 4 2	
Someshwar R.F. (roadside).	1920–21	158·40	486 15 11	1,344 1 8	1,831 1 7	11 9 5	3,293 1 0	20 12 7	
Someshwar R.F. near Someshwar bazaar.	1926–27 and 1927–28.	500·00	2,049 12 0	962 8 0	3,012 4 0	6 0 4	4,773 3 0	9 8 9	
	Total	3,792·52	12,653 9 0	12,724 14 11	24,640 11 5	7 12 0	41,464 12 11	11 6 0	

NOTE—The costs of formation and tending, and the totals given in column (8), include district overhead charges, as well as other indirect charges such as share of Conservator and Chief Conservator. These have been kept and recorded additionally in the 'pro forma' accounts maintained by the division for each of the plantations separately. The total sum spent on the above [shown in column (6)] is therefore Rs. 24,640 without interest.

SECTION 4.—METHOD OF TREATMENT.

450. The object of the several measures prescribed hereunder is to ensure continuity of treatment for these plantations independently of coupes regenerated under the prescriptions of the Timber Working Circle. Separate individual treatment for each plantation is necessary, but it is impossible on paper to define exactly the modifications in procedure which will be called for in practice. The operations named hereunder will serve to indicate a general programme of operations, but no measures thus prescribed can be carried out mechanically. Detailed silvicultural supervision must be given by the District Forest Officer in order to impart the greatest benefit possible to the crop, and *it cannot be emphasized too strongly that adequate supervision by the District Forest Officer, the training by him of those who will execute the work and constant vigilance on his part to ensure that the work is not left to uninstructed persons, are all essential to success. It is a constant source of complaint that work of this nature is left to the coolie working under the supervision of a subordinate whom no one has instructed and who is completely ignorant of what he is doing. There can be no rule of thumb*; this is particularly so when removal of shade is carried out. It is impossible to forecast operations for more than five years ahead in these plantations. Accordingly it is prescribed that the District Forest Officer shall personally inspect each plantation quinquennially, in certain years laid down in the tabular statement of operations (vide paragraph 456). He will on such occasions perambulate the entire coupe and record his observations in the Control Journal along with an explicit note describing such operations as he considers necessary to be carried out during the ensuing years before this plan is revised. To afford guidance, general instructions are given below.

451. *General considerations.*—The chief criticism to be made of the present condition of the young crops is that they appear to be adding little increment. The causes are not always clear, but the following types of condition prevail in various areas; prescriptions and suggestions to deal with them are made below:—

(*a*) *Dense canopy and low overhanging shade.*—In almost every plantation a reduction of shade is urgently required to stimulate the growth of the young *Hopea*. Trees constituting the upper canopy do not cantain a large number of exploitable individuals; on the contrary they are often small and stunted. A thinning out of the dominant top canopy is therefore not advised on any large scale, but the management should endeavour to realize revenue where possible by the felling of exploitable trees, provided always that the future of the young crop is not prejudiced by their removal. Evergreen foliage in the middle-storey is too low and dense on seven-tenths of the area. A heavy reduction should first be made in all trees of less than 25 feet in height (with certain exceptions named below). In the older plantations of 1920–22 a reduction of about 50 per cent of low shade is prescribed, especially, where branches interfere with the leading shoots of *Hopea* saplings.

(*b*) *Presence of Strobilanthes and Leea.*—Both these species tend to spread in a dense thicket whenever conditions are favourable. When in admixture with other competing species of ground-flora they are not objectionable, but as dominant species both are inimical to the growth of *Hopea*, particularly the former. Strobilanthes is often dominant on poorer classes of soil where shade canopy is light; *Leea* on the other hand prefers a richer and deeper soil and subsists under heavier shade. Both species probably gain predominance by successful root-competition.

Where Strobilanthes has gained domination of a locality but *Hopea* plants still survive, the former shall be cut back all round the suppressed *Hopea* to a radius of at least 4 feet. This operation should be done by cutting the Strobilanthes through the ærial roots below the collum. When Strobilanthes is common in a locality, any further reduction of shade in the upper canopies must be done with judicial care, so as not to encourage its further spread. It is to be remembered that the heavy incidence of this weed has in many cases been directly brought about by excessive opening at too early a stage in the life of the *Hopea*.

Leea may reach to 16 feet or more in height in favourable localities, even under a very tolerable degree of shade (e.g., Jatkatmale, bit III—north-east of Doddinajeddu). It is however greatly stimulated by light, so that any further opening of canopy in such localities must be gradual. It is suggested that where found oppressive it should be cut back to ground level for 4 or 5 feet all around *Hopea* stems, and kept back.

(*c*) *Hard, shallow and gravelly soil.*—*Hopea* plants in shallow laterite soil are not fast-growing. The older shade-crop is often correspondingly stunted and low.

Where height increment of *Hopea* plants is lagging, soil working around the roots may be beneficial. A *cautious* removal of low overhanging branches should also be made.

(*d*) *Ill-drained, clayey soil.*—This condition is infrequent in the plantations, but where found, æration of the soil by forking around the roots of seedlings should be tried.

452. *Treatment of failed areas.*—The extent of failed areas in this division is inconsiderable, and accordingly no detailed prescriptions such as are given for the Plantation Working Circle for South Mangalore Division are laid down. Should occasion arise, they should however, be consulted for guidance. Areas already "written off", e.g., Jatkatmale, 1920–21—Bit II, will not be specially tended. The energies of the staff must be directed towards securing the maximum of success with the plantations established, and not to the filling up of blanks. Strobilanthes is the principle cause of failure, and it is not yet known exactly how to deal with this pest.

453. *Tending.*—The operations designated under the general heading of "tending" will vary on each acre. The main object of the operations will be to encourage height-growth in the *Hopea* and prevent faster growing species from overwhelming the plantations.

454. *Removal of overhead shade from established* Hopea parviflora *plants* (3 *feet high and above*).—Removal of overhead shade from established *Hopea* is the first essential to be considered in the majority of plantations formed prior to 1927–28.

The prescriptions given below are practically identical with those laid down for similar crops in the Timber and Plantation Working Circles in South Mangalore Division.

Removal of shade.—All very low overhanging shade likely to cause "drip" should be removed in the first year of formation. In *Hopea parviflora* plantations of the past, the evergreen underwood up to 25 or 30 feet high has been removed usually (but not always) in about the third year of formation. This was premature in a number of cases, while in others, even if something was required the opening has been excessive ; but if the operation is postponed until the sixth year or subsequently, the growth of seedlings has been decidedly impeded. In this Working Circle, the programme of operations as shown in the tabular statement below does not provide for intensive operations in a coupe after the third year until the District Forest Officer himself prescribes any during his inspection in the fifth year after felling. Thus, while definite prescriptions regarding the actual year of shade removal are laid down, it should be borne in mind that if low overhead shade is not removed during the first three years, it will necessarily remain until the sixth year or even later, which may be detrimental to the crop if shade is heavy. It is accordingly *suggested* that some low shade be removed during the course of the first three years, *but that this be done with caution, lest weeds gain the upper hand.* If the locality has been well chosen, no harm to the crop is likely to result from a moderate exposure of the ground to light, provided there is still an upper leaf canopy to give broken shade ; but there will certainly be danger from weed-growth unless the operation be done with care. The District Forest Officer should give very precise instructions for further shade removal after his quinquennial inspection of the coupe. He will enter these in the Control Journal.

455. *Thinnings.*—Thinnings will not be necessary in plantations during the period of the working plan.

456. SECTION 5.—TABULAR STATEMENT OF OPERATIONS.

Name of block.	Year of sowing or planting.	Year of operation.	Nature of operation.
Jatkatmale ..	1920–21 (Bit I).	1933–34 ..	(1) Removal of low shade. (2) Climber cutting.
		1934–35 ..	Inspection by District Forest Officer.
		1935–36 ..	Removal of low shade, and obstructing branches.
		1936–37 ..	Tending and climber-cutting by beat guard.
		1937–38 ..	Nil.
		1938–39 ..	Nil.
		1939–40 ..	Inspection by District Forest Officer.
		1940–41 ..	Removal of obstructing branches.
	1921–22 (Bit II).	1932–33 ..	(1) Removal of about 40 per cent of evergreen low shade, especially where *interfering with* heads of *Hopea parviflora.* (2) Climber-cutting and pruning of double leaders.
		1933–34 ..	Nil.
		1934–35 ..	Nil.
		1935–36 ..	Inspection by District Forest Officer.
		1936–37 ..	Further low shade removal and climber-cutting.
		1937–38 ..	Tending and climber-cutting by beat guard.
		1938–39 ..	Nil.
		1939–40 ..	Nil.
		1940–41 ..	Inspection by District Forest Office

Name of block.	Year of sowing or planting.	Year of operation.	Nature of operation.
Jatkatmale—*cont.*	1921–22 (Bit III).	1932–33 ..	(1) Soil-working around plans in gravelly laterite in southern portions. (2) Light shade removal where necessary.
		1933–34 ..	(1) Experimental cutting of *Leea* and tall undergrowth to ground level over 2 acres. (2) Removal of about 50 per cent of low shade. (3) Climber-cutting.
		1934–35 ..	General tending and climber-cutting by beat guard.
		1935–36 ..	Inspection by District Forest Officer.
		1936–37 ..	Works as ordered by District Forest Officer.
		1937–41 ..	Do.
	1922–23 ..	1932–33 ..	Nil.
		1933–34 ..	General tending and climber cutting by beat guard.
		1934–35 ..	Reduction of low shade and obstructing branches.
		1935–36 ..	Climber-cutting by beat guard.
		1936–37 ..	Inspection by District Forest Officer.
		1937–38 ..	Reduction of low shade, or as ordered by District Forest Officer.
		1938–41 ..	Do.
Holesomeshwar	1922–23 ..	1933–34 ..	(1) Removal of low shade and overhanging branches. (2) Climber-cutting.
		1934–35 ..	Nil.
		1935–36 ..	Tending and climber-cutting.
		1936–37 ..	Inspection by District Forest Officer.
		1937–38 ..	Further reduction of low shade or as ordered by District Forest Officer.
		1938–39 ..	As ordered by District Forest Officer.
		1939–41 ..	Do.
	1923–24 ..	1932–33 ..	Tending and climber-cutting.
		1933–34 ..	Nil.
		1934–35 ..	(1) Removal of low shade and overhanging branches. (2) Climber-cutting.
		1935–36 ..	Nil.
		1936–37 ..	Tending and climber-cutting by beat guard.
		1937–38 ..	Inspection by District Forest Officer.
		1938–39 ..	Further shade removal or as ordered by District Forest Officer.
		1939–41 ..	As ordered by District Forest Officer.
	1925–26 ..	1933–34 ..	(1) Reduction of low shade where necessary. (2) Climber-cutting and weeding.
		1934–35 ..	Nil.
		1935–36 ..	Nil.
		1936–37 ..	Weeding and climber-cutting.
		1937–38 ..	Inspection by District Forest Officer.
		1938–39 ..	Further shade reduction.
		1939–40 ..	As ordered by District Forest Officer.
		1940–41 ..	Do.
Someshwar ..	1920–21 ..	1932–33 ..	Removal of low shade and climber-cutting.
		1933–34 ..	Inspection by District Forest Officer.
		1934–35 ..	Removal of low shade and obstructing branches.
		1935–36 ..	Tending and climber-cutting by beat guard.
		1936–37 ..	Nil.
		1937–38 ..	Nil.
		1938–39 ..	Inspection by District Forest Officer.
		1939–42 ..	Works as ordered by District Forest Officer.
	1927–28 ..	1932–33 ..	Soil-working round backward plants.
		1933–34 ..	Nil.
		1934–35 ..	Reduction of low shade where necessary. Weeding and climber cutting.
		1935–36 ..	Nil.
		1936–37 ..	Nil.
		1937–38 ..	Inspection by District Forest Officer.
		1938–39 ..	Further shade reduction.
		1939–42 ..	Works as ordered by District Forest Officer.

SECTION 6.—CONTROL.

457. The following Control records shall be maintained by the District Forest Officer :—

The Plantation Ledger
and
The Control Journal.

CHAPTER V.—WORKING PLAN FOR THE FUEL WORKING CIRCLE.

SECTION 1.—GENERAL CONSTITUTION OF THE WORKING CIRCLE AND CHARACTER OF THE VEGETATION.

458. This working circle includes such of the coastal reserves as are suitable for fuel extraction, and those reserves situated inland at a distance of about 20 to 25 miles from the coast, which possess facilities for extraction of fuel on economic lines. The area of this working circle, is 19,139 acres distributed among the following eight felling series :—

Name.	Constitution.		Area.
	Reserve.	Area.	
(1)	(2)	(3)	(4)
		ACS.	ACS.
1 The Kadike Felling Series ..	Karnigudde	824	
	Sarpanamane	489	
	Kadike	1,570	
			2,883
2 The Baindur Felling Series ..	Baindur (part)	961	
	Guruvanacote	1,482	
			2,443
3 The Golihole Felling Series ..	Kursegudde (part)	1,577	
	Hulimishepare	1,914	
			3,491
4 The Herur Felling Series ..	Herur (part)	2,126	2,126
5 The Alur Felling Series ..	Abbigudde	1,281	
	Jennalane	666	
	Korakoppadahola	406	
			2,353
6 The Wandse Felling Series ..	Chittur	1,781	
	Nujinane	639	
	Talaburane	561	
			2,981
7 The Ampar Felling Series ..	Suraladvi	527	
	Kamradihola	761	
	Halakkihola	699	
			1,987
8 The Kodyamale Felling Series.	Kodyamale	875	
			875
		Total ..	**19,139**

459. The following considerations have prevailed in enhancing the number of fuel felling series in Coondapoor Range from three to six :

(*a*) The working of large fuel coupes involves a big capital outlay which the local people can neither afford nor desire to venture. Reduction in the areas of annual coupes is likely to promote keener competition among bidders as it provides possibilities for a large number of small contractors to bid at the auction.

(*b*) Adequate labour for felling and transport is not available if extensive areas in one locality are annually felled over. Past coupes were often allowed to fall into arrears owing to the above difficulty.

(*c*) Provision of a large number of felling series eases to some extent the difficulties now experienced by the villagers in obtaining their annual requirements of green and dry leaf-manure and dead fuel. Closure of large worked areas to the exercise of special concessions in any one locality has invariably led to discontentment and has possibly created real hardship.

460. *Character of the vegetation.*—The reserves in the Fuel Working Circle can be classified into two groups ; one consisting of the coastal reserves, and the other comprising the inland reserves situated at varying distances of 20 to 25 miles from the coast. The coastal reserves are situated on a shallow, laterite soil, which supports a dry, open type of fuel forest ; whereas the inland reserves approximate to a degraded type of high forest with a good mixture of fuel species.

The following brief description of the character of the vegetation in each felling series is given :—

The Kadike Felling Series comprises the whole of Kadike, Karnigudde and Sarpanamane reserves. Kadike reserve was formerly worked under the system of ' Simple

Coppice.' Coppice regrowth is dense and vigorous. Sarpanamane reserve contains a scattered tree crop; the entire reserve has been worked over under the system of 'Coppice with Standards.' Part of Karnigudde was worked recently under 'Simple Coppice' and the unfelled parts of the reserve contain timber species such as *Xylia xylocarpa, Terminalia paniculata* and *Lagerstrœmia lanceolata* as well as an abundance of fuel species. The reserve is well stocked, and coppice regrowth is vigorous. *Hopea wightiana,* attended by regeneration of that species, is present in moist localities.

The Baindur Felling Series includes the better stocked portions of Baindur and the whole of Guruvanacote reserves. Portions of the latter are of moist deciduous type containing some small timber; but the western parts are poorly stocked. The eastern and northern portions of Baindur reserve included in this series are fairly well stocked with fuel species, but the western portions of the reserve are lateritic and rocky, and so are considered unsuitable for inclusion in the series. An area of 1,080 acres in this series has been worked previously either as 'Simple Coppice' or as 'Coppice with Standards.'

The Golihole Felling Series comprises the whole of Hulimishepare and the better stocked portions of Kursegudde reserve on the north-west. The whole of Hulimishepare has been already felled over once under the method of 'Simple Coppice.' Most of the area is sparsely stocked and contains many grassy blanks. The worked portions of Kursegudde reserve contain old standards, about 20 to an acre. Coppice regeneration is moderately satisfactory but slow. The unworked parts contain small timber and scrub.

The Herur Felling Series is formed out of the better stocked areas of Herur reserve. The eastern portion of the reserve is well stocked with miscellaneous species fit for fuel, and some timber of larger dimensions. Tree growth diminishes in quality towards the western limits of the reserve, in which locality the vegetation being sparse and degraded has been deemed unfit for inclusion in the felling series. About 700 acres of this series have been worked under the system of 'Coppice with Standards.'

The Alur Felling Series constitutes the whole of Abbigudde, Jennalane and Korakoppadahola reserves. It is better stocked than any of the foregoing series. Many parts of this series contain small timber, yet they are not of sufficient value or importance to be rightly considered as 'timber forest.' The bulk of the fuel obtainable from this series will be fit for despatch to Bombay. Coppice regrowth is very vigorous in the felled areas. Most of Abbigudde, the whole of Korakoppadahola and part of Jennalane reserves have been previously felled either under the method of 'Simple Coppice' or as 'Coppice with Standards.'

The Wandse Felling Series comprises the whole of Talaburane, Nujinane and Chittur reserves. The whole of Talaburane has been felled over once under 'Simple Coppice,' regrowth of coppice shoots is fairly vigorous. *Macaranga roxburghii* is invading the area. Some sandal saplings also exist. The whole of Nujinane has been worked over once, mostly under 'Simple Coppice' and partly under 'Coppice with Standards.' Chittur reserve exhibits all varieties of vegetation in this category, from well stocked first quality fuel in the south to poor open scrub in the middle region. About 670 acres of this reserve have been worked previously under 'Coppice with Standards,' and the first coupe under Mr. Habibulla's scheme is being worked now. The reserve contains a sparse distribution of sandal towards the south.

The Ampar Felling Series includes the whole of Suraladvi, Kamradihola and Halakkihola reserves. The whole of Suraladvi has been felled over once either under the system of 'Coppice with Standards' or as 'Simple Coppice.' Regeneration from coppice is fairly satisfactory. Part of Kamradihola was worked before under 'Coppice with Standards.' Parts of this reserve adjoining the Chakranadhy support fairly dense fuel forest in addition to timber species. Part of Halakkihola reserve has been recently felled under 'Simple Coppice' and the remaining unfelled area supports a good quality fuel forest with some small timber.

The Kodyamale Felling Series comprises part of Kodyamale reserve. Part of this reserve has been felled from 1918 either under 'Coppice with Standards' or as 'Simple Coppice.' Regrowth of coppice is slow. The unfelled portions of this reserve contain sparse distribution of fuel species interspersed by rocky blanks or scrub type. The reserve has not been worked under any regular working plan. Every year one coupe is sold in public auction, but in practice the sale amounts to private tender. In future, should demand at public auction appear lacking, the management may close down this series.

SECTION 2.—DIVISION OF THE AREA.

460-A. No attempt has been made to divide the areas falling under this working circle into blocks and compartments. Each reserve, which is generally small, shall be considered to constitute a block bearing the name of the reserve. The area to be worked in each felling series during the period of this plan is divided into ten coupes indicated by serial numbers.

SECTION 3.—ANALYSIS AND VALUATION OF THE CROP.

461. No enumerations or valuation surveys were made. Owing to the heterogeneous nature of the forests constituting this working circle, enumerations or valuation surveys would yield no useful results ; nor would any expense incurred in that direction be justifiable.

SECTION 4.—METHOD OF TREATMENT.

462. *System.*—The silvicultural system prescribed is 'Simple Coppice.'

463. *Rotation.*—The rotation will be 40 years. The object of management is to produce good quality billet fuel-wood of 15 to 24 inches in girth, which fetches a good price in Bombay and local markets. Rotations varying from 15 to 25 years have been adopted for fuel series in the past, but the resultant size of coppice shoots in felled coupes indicates that such a period is inadequate for the production of economical sizes of billet. Mr. Habibulla, during the preparation of a fuel scheme for Coondapoor Range, collected data by measuring girths of coppice shoots in felled coupes of each series of Coondapoor Range, in order to estimate the mean annual girth increment of fuel species and eventually to determine the rotation for fuel coupes. Measurements of coppice shoots were taken at four feet from ground level in nine different reserves of Coondapoor Range of various qualities, and degrees of stock and age. An abstract of his figures is recorded in Chapter VI of Part I. His results indicate that the average mean annual girth increment of coppice shoots is 0·6 of an inch. Suitable dimensions of fuel wood can be produced with a rotation of 40 years. In two felling series, viz., Alur and Kadike, a shorter rotation might be permissible, as the coppice regeneration in felled coupes is very vigorous, but the maintenance of a uniform rotation for the entire Fuel Working Circle is desirable. The production of rather larger sizes in these two series is not considered any disadvantage, as there is always a large local demand for small timber. Hitherto, these two felling series have fetched much higher prices than any of the other fuel series. The data recorded above, however, refer to coppice stems resulting under conditions rarely favourable to rapid growth. Weeds, climbers and fast-growing species were frequently dense and oppressive, so that a maximum increment was probably not obtained. On the other hand the requisite degree of vigour in the stool shoots, to enable them rapidly to overcome these disadvantages, can best be obtained by prolonging the period of rest between fellings, and at the same time soil and humus conditions may be expected to improve.

464. *Yield.*—The yield is regulated by area. Roughly one-fortieth of the area of each felling series will be felled annually. The yield in chowks (one chowk is equal to 216 cubic feet of stacked billet fuel wood, or roughly three tons) per acre has been roughly estimated by eye, past yields obtained from worked fuel coupes also being taken into consideration. The figures showing yields from the several felling series provided in the following table are therefore only an approximate forecast.

Felling series.	Area in acres.	Average area of coupe in acres.	Average yield per acre in chowks.	Average outturn per annum in chowks.
1 The Kadike Felling Series ..	2,883	72	8·0	576
2 The Baindur Felling Series ..	2,443	61	7·0	427
3 The Golihole Felling Series ..	3,491	87	8·5	740
4 The Herur Felling Series ..	2,126	53	8·0	424
5 The Alur Felling Series ..	2,353	59	10·0	590
6 The Wandse Felling Series ..	2,981	74	7·0	518
7 The Ampar Felling Series ..	1,987	50	8·0	400
8 The Kodyamale Felling Series.	875	20	4·0	80
Total ..	..	**476**	..	**3,755**

SECTION 5.—METHOD OF EXECUTING THE FELLINGS.

465. Annually one coupe in each felling series will be sold in public auction to a contractor who will execute a simple coppice felling in accordance with the terms of the agreement now in force in the division subject to the following modifications :—

(*a*) All dead trees in the coupe shall be felled.

(*b*) All bamboo clumps in the coupe shall be felled.

(*c*) Strobilanthes, if any, shall be cut back below the aerial root.

(*d*) Adequate hosts and side-shelter shall be left to ensure the survival of existing sandal seedlings and saplings.

The following additional rules regarding the mode of felling will be adhered to :—

(1) Each coupe (except the coupes in Kodyamalai series which will not be subdivided into strips) shall be divided into not less than three strips of approximately equal size before commencing felling.

(2) Felling shall proceed in the serial order of the strips and the contractor shall not be allowed to fell in the adjoining strip, until the Range Officer has inspected the felled strip and certified in writing that the work has been carried out satisfactorily.

(3) All growth shall be cut as close to ground level as is practicable. Stumps of undesirable species are to be hacked so as to prevent coppice.

(4) Felling shall commence from the top and proceed progressively downward until the strip is completed.

(5) Extraction roads will be constructed and maintained by the felling contractor at his own expense. This work will be done in accordance with the instructions of the Range Officer.

466. SECTION 6.—TABULAR STATEMENT OF FELLINGS AND SUBSIDIARY OPERATIONS.

Year.	Felling and coppicing.		Regeneration in blanks.		Climber-cutting.		Cleaning.	
	Coupe number.	Area in acres.	Coupe number.	Area in acres.	Coupe number.	Area in acres.	Coupe number.	Area in acres.
			I. The Kadike Felling Series.					
1932–33	I	76	..	..	..	..	..	..
1933–34	II	72	I	76	I	76	I	76
1934–35	III	77	II	72	II	72	II	72
1935–36	IV	70	III	77	III	77	III I	77 76
1936–37	V	80	IV	70	IV	70	IV II	70 72
1937–38	VI	75	V	80	V I	80 76	V III	80 77
1938–39	VII	63	VI	75	VI II	75 72	VI IV	75 70
1939–40	VIII	65	VII	63	VII III	63 77	VII V	63 80
1940–41	IX	72	VIII	65	VIII IV	65 70	VIII VI	65 75
1941–42	X	70	IX	72	IX V	72 80	IX VII	72 63
		720		**650**		**1,025**		**1,163**
			II. The Baindur Felling Series.					
1932–33	I	57	..	..	..	..	..	..
1933–34	II	61	I	57	I	57	I	57
1934–35	III	60	II	61	II	61	II	61
1935–36	IV	68	III	60	III	60	III I	60 57
1936–37	V	62	IV	68	IV	68	IV II	68 61
1937–38	VI	60	V	62	V I	62 57	V III	62 60
1938–39	VII	60	VI	60	VI II	60 61	VI IV	60 68
1939–40	VIII	60	VII	60	VII III	60 60	VII V	60 62
1940–41	IX	60	VIII	60	VIII IV	60 68	VIII VI	60 60
1941–42	X	61	IX	60	IX V	60 62	IX VII	60 60
		609		**548**		**856**		**976**
			III. The Golihole Felling Series.					
1932–33	I	82	..	..	..	..	..	..
1933–34	II	82	I	82	I	82	I	82
1934–35	III	80	II	82	II	82	II	82
1935–36	IV	82	III	80	III	80	III I	80 82
1936–37	V	88	IV	82	IV	82	IV II	82 82
1937–38	VI	86	V	88	V I	88 82	V III	88 80
1938–39	VII	91	VI	86	VI II	86 82	VI IV	86 82
1939–40	VIII	92	VII	91	VII III	91 80	VII V	91 88
1940–41	IX	91	VIII	92	VIII IV	92 82	VIII VI	92 86
1941–42	X	86	IX	91	IX V	91 88	IX VII	91 91
		860		**774**		**1,188**		**1,365**

Year.	Felling and coppicing.		Regeneration in blanks.		Climber-cutting.		Cleaning.	
	Coupe number.	Area in acres.	Coupe number.	Area in acres.	Coupe number.	Area in acres.	Coupe number.	Area in acres.
			IV. The Herur Felling Series.					
1932–33	I	49	..	..	..	..	..	..
1933–34	II	51	I	49	I	49	I	49
1934–35	III	54	II	51	II	51	II	51
1935–36	IV	50	III	54	III	54	III I	54 49
1936–37	V	53	IV	50	IV	50	IV II	50 51
1937–38	VI	51	V	53	V I	53 49	V III	53 54
1938–39	VII	50	VI	51	VI II	51 51	VI IV	51 50
1939–40	VIII	52	VII	50	VII III	50 54	VII V	50 53
1940–41	IX	57	VIII	52	VIII IV	52 50	VIII VI	52 51
1941–42	X	59	IX	57	IX V	57 53	IX VII	57 50
		526		**467**		**724**		**825**
			V. The Alur Felling Series.					
1932–33	I	50	..	..	..	..	..	..
1933–34	II	54	I	50	I	50	I	50
1934–35	III	55	II	54	II	54	II	54
1935–36	IV	60	III	55	III	55	III I	55 50
1936–37	V	60	IV	60	IV	60	IV II	60 54
1937–38	VI	60	V	60	V I	60 50	V III	60 55
1938–39	VII	60	VI	60	VI II	60 54	VI IV	60 60
1939–40	VIII	60	VII	60	VII III	60 55	VII V	60 60
1940–41	IX	55	VIII	60	VIII IV	60 60	VIII VI	60 60
1941–42	X	55	IX	55	IX V	55 60	IX VII	55 60
		569		**514**		**793**		**913**
			VI. The Wandse Felling Series.					
1932–33	I	78	..	..	..	..	..	..
1933–34	II	76	I	78	I	78	I	78
1934–35	III	76	II	76	II	76	II	76
1935–36	IV	76	III	76	III	76	III I	76 78
1936–37	V	76	IV	76	IV	76	IV II	76 76
1937–38	VI	81	V	76	V I	76 78	V III	76 76
1938–39	VII	79	VI	81	VI II	81 76	VI IV	81 76
1939–40	VIII	81	VII	79	VII III	79 76	VII V	79 76
1940–41	IX	76	VIII	81	VIII IV	81 76	VIII VI	81 81
1941–42	X	76	IX	76	IX V	76 76	IX VII	76 79
		775		**699**		**1,081**		**1,241**
			VII. The Ampar Felling Series.					
1932–33	I	47	..	..	..	..	..	..
1933–34	II	47	I	47	I	47	I	47
1934–35	III	47	II	47	II	47	II	47
1935–36	IV	47	III	47	III	47	III I	47 47
1936–37	V	47	IV	47	IV	47	IV II	47 47
1937–38	VI	48	V	47	V I	47 47	V III	47 47
1938–39	VII	54	VI	48	VI II	48 47	VI IV	48 47
1939–40	VIII	56	VII	54	VII III	54 47	VII V	54 47
1940–41	IX	56	VIII	56	VIII IV	56 47	VIII VI	56 48
1941–42	X	50	IX	56	IX V	56 47	IX VII	56 54
		499		**449**		**684**		**786**

Year.	Felling and coppicing. Coupe number.	Felling and coppicing. Area in acres.	Regeneration in blanks. Coupe number.	Regeneration in blanks. Area in acres.	Climber-cutting. Coupe number.	Climber-cutting. Area in acres.	Cleaning. Coupe number.	Cleaning. Area in acres.
VIII. The Kodyamale Felling Series.								
1932–33	I	23	..	..	..	..	..	..
1933–34	II	20	I	23	I	23	I	23
1934–35	III	23	II	20	II	20	II	20
1935–36	IV	21	III	23	III	23	III	23
							I	23
1936–37	V	20	IV	21	IV	21	IV	21
							II	20
1937–38	VI	19	V	20	V	20	V	20
					I	23	III	23
1938–39	VII	22	VI	19	VI	19	VI	19
					II	20	IV	21
1939–40	VIII	20	VII	22	VII	22	VII	22
					III	23	V	20
1940–41	IX	20	VIII	20	VIII	20	VIII	20
					IV	21	VI	19
1941–42	X	20	IX	20	IX	20	IX	20
					V	20	VII	22
		208		**188**		**295**		**336**

SECTION 7.—SUBSIDIARY SILVICULTURAL REGULATIONS.

467. Regeneration by coppice will be relied upon for the most part, supplemented by root-suckers and natural seedling reproduction. Artificial regeneration of blanks may, however, be necessary, and will be carried out in accordance with the instructions given hereunder in the year following that of felling. Such assistance may also be necessary in patches of forest where existing species are unsuited for fuel or timber.

468. Patches thus artificially regenerated, if small, are likely to be lost sight of, and may prove uneconomical to maintain. Artificial regeneration shall, therefore, be limited to patches of not less than half an acre in extent, and such patches shall be treated intensively.

469. The Range Officer at the time of laying out the coupe before sale, shall make a detailed reconnaissance of the area and mark on a plan of the coupe to a scale of four inches to one mile, patches which require to be artificially regenerated. He shall serially number the patches to be so treated and at the same time make notes in the field regarding the composition and density of the ground flora in each patch, and the species proposed to be introduced therein. This preliminary is essential as the suitability of a locality for the species to be introduced is best judged when tree-cover and ground flora are still undisturbed. At the time of inspection of the coupe by the District Forest Officer either during felling or after it, he shall review the Range Officer's recommendations regarding the patches and issue final orders. In the month of April following a felling the Range Officer will inspect the coupe again with a view to add to the number of patches to be artificially treated, if necessary. Selected patches will be treated in the following manner :—

(1) Where the gound flora is essentially of an evergreen or moist deciduous association the floor should be cleared of all vegetation, and seeds of *Hopea wightiana* sown broadcast in the month of June.

(2) In deciduous localities the patches should be burnt as well as possible. Should there be insufficient material to obtain an even burn over the whole patch, whatever material is available should be collected in lines and burnt at the end of April. About the middle of May, seeds of *Terminalia tomentosa*, *Terminalia paniculata*, *Xylia xylocarpa*, *Pterocarpus marsupium* and *Dalbergia latifolia* shall be dibbled in prepared patches on the burnt areas. Teak stumps shall be introduced in suitable localities. No regular alignment or espacement is prescribed, but the sown patches shall not be closer than 4′ × 4′, judging by eye.

(3) In lateritic or open gravelly patches devoid of growth, seeds of *Anacardium occidentale* should be dibbled at an espacement of 6′ × 6′. In such situations it may be necessary to loosen the top soil to a depth of six to eight inches before sowing. This species readily adapts itself to soils unsuited for other species. It is also a useful fuel wood.

The object of the above regeneration measures is to secure a full and even distribution of valuable species.

470. *Climber-cutting.*—Two climber-cuttings will be done in each coupe during the period of this plan. One will be in the month of November following the year of felling and another five years after felling. This operation will consist in freeing coppice shoots of valuable species from suppression by climbers and creepers.

471. *Weeding and cleaning.*—This operation will be done in the month of November following felling. It will consist in weeding around seedlings, and root-suckers, and in effective removal of creepers and scandent shrubs obstructing coppice shoots. Bamboo shoots should at the same time be cut back. Fast-growing soft-wooded species like *Macaranga roxburghii*, *Trema orientalis* and *Grewia laevigata* readily take hold of fresh clearings and these species should be continuously kept in check, wherever they interfere actively with coppice or seedling growth; otherwise they should be left. These operations shall be executed as liberally as funds will permit.

472. Another cleaning shall be carried out, if necessary, in the third year after felling.

473. No special tending is prescribed for the artificially regenerated patches. They shall receive the same tending operations as prescribed above for the balance of the area. Generally, artificially raised seedlings should be preferred to coppice regeneration, in such patches. The beat guard should be made responsible that artificially regenerated patches are not neglected. He should tend the patches if and when necessary and the Range Officer should frequently inspect them. In the third year after felling the District Forest Officer will make an examination of the artificially treated patches and enter notes in his Control Journal regarding the regeneration. Special attention may be extended at his discretion to any patch requiring it.

474. Thinnings among coppice shoots shall be carried out, if the District Forest Officer considers it necessary, along with the second cleaning.

SECTION 8.—OTHER MISCELLANEOUS REGULATIONS.

475. All coupes under regeneration will be closed to grazing and to the exercise of the special concessions for a period of six years from the year of felling. The ryots should be induced to obtain their requirements of green manure leaves as far as possible, by allowing them to cut trees and branches of unclassified species below specified dimensions in the year prior to the felling of the coupe.

476. All reserves included in this working circle shall be fire-protected by cutting and burning the boundary lines to a width of 20 feet. Internal coupe lines shall be fire-traced to a width of 10 feet. All admitted rights of way inside such reserves should be burnt to a width of 15 feet. All areas, which have been clear-felled and where the regeneration is six years or less in age, will be subjected to rigid fire protection (vide paragraph 578).

477. The coupe shall be surveyed and demarcated in January of the year preceding felling. At the corners of each coupe as well as at all principal junctions with roads or paths, coupe stones shall be planted showing the coupe number, area and the year of working. Coupe lines shall be cleared of all growth to a width of 12 feet before they are sold but they need not be subsequently maintained. Strip lines shall be cleared to a width of 5 feet. Old coupe stones should be unearthed and defaced.

478. *Indicator areas.*—Two representative half-acre plots in each annual coupe shall be laid out by the Range Officer at the time of demarcation of the coupe before sale. Each plot shall be felled under departmental supervision and the outturn of fuel and timber shall be recorded by the Range Officer and a copy submitted to the District Forest Officer for record in the remarks column of the Control Book. The extent of the indicator areas shall also be included in the area of the coupe at the time of sale, and the successful contractor shall pay a rate of Rs. 20 per acre for felling and stacking the produce obtained from the indicator areas.

SECTION 9.—CONTROL.

479. The control forms, sample entries of which are given in Appendix II, shall be maintained by the District Forest Officer and he shall be personally responsible for the correct posting of the forms. The control forms prescribed are :—

The Control Book,
The Record of Works, and
The Control Journal.

Control maps are not separately prescribed but sketches of coupes annually worked should be posted in the front page of the Control Journal. Areas shall be recorded to the nearest acre.

The Control Book shall consist of a bound book containing a sufficient number of the forms prescribed. An appropriate number of pages shall be allotted to each felling series.

Any coupe remaining unsold or areas left unworked at the end of the year shall be brought forward in red ink in the left-hand column of the page for re-auctioning in the next year, at the time the Control Book is posted. The outturn of timber and fuel obtained from felling indicator areas shall be recorded in the " Remarks " cloumn of the Control Book.

A similar bound book shall be maintained for the Record of Works, allotting a sufficient number of pages for each felling series.

The Control Journal will be a bound volume containing blank pages, and maintained under the headings prescribed in the Forest Code. The District Forest Officer should take it into camp and record any useful observations he may make in the field.

CHAPTER VI.—WORKING PLAN FOR THE PROTECTION WORKING CIRCLE.

480. *General constitution.*—This working circle comprises all the ghat forests at present considered inaccessible or uneconomical to work, the immature timber areas of the plains and foot-hill portions, the degraded timber forests and the scrub jungles of the coastal reserves. With improved facilities for extraction and marketting of timber, it is probable that parts of this working circle may in the future prove susceptible of intensive working, but for the time being such areas are classed as purely protective. All areas not directly allotted to any other working circle, excepting the Minor Produce and Grazing Working Circles, have been included in this working circle. The total extent of this working circle is 224,305 acres.

481. *Valuation.*—No enumerations were carried out in this working circle, but almost the entire area was stock-mapped to types which are shown on Survey of India sheets 2 inches to a mile.

482-3. *Treatment.*—No systematic working is prescribed for this working circle. The subordinates in charge of the respective beats shall free valuable tree growth from climbers and creepers. For this purpose, the District Forest Officer, during his annual inspection of the reserves, shall specify the areas mostly infested with climbers and direct the guards to take them in hand first.

CHAPTER VII.—WORKING PLAN FOR THE CUTCH WORKING CIRCLE.

SECTION 1.—GENERAL CONSTITUTION OF THE WORKING CIRCLE AND CHARACTER OF THE VEGETATION.

484. This working circle comprises all the reserves and unreserves of Coondapoor Range containing an appreciable quantity of *Acacia sundra* growth. Small, scattered patches of *Acacia sundra* have been excluded from the scope of this working circle as they are considered uneconomic to work, and as operations in them would be difficult to control. The forest covered by this working circle is more or less in a compact block towards the north in Baindur section, and gradually becomes diffuse towards the south in the Wandse section. The area of this working circle is 13,982 acres.

485. *Felling Series.*—Four felling series have been constituted designated A, B, C and D. Felling series ' A ' and ' C ' are constituted out of the reserved forests in Baindur and Wandse sections respectively. These two series shall be considered ' Reserve Felling Series ' to be opened for exploitation when the yield from the other two series is insufficient to meet the demand. Felling series ' B ' and ' D ' are formed out of the unreserves of Baindur and Wandse sections respectively.

486. The reasons for increasing the number of series from two to four are :—

(1) Distribution of the area, which is capable of a large annual yield, into smaller coupes is desirable in order to induce smaller contractors to compete at the auctions.

(2) It is unlikely that the entire output of cutch from the division will be absorbed for some years to come, unless a ready foreign market is secured ; chances of this appear remote, especially owing to the present economic depression. Conservation of *Acacia sundra* in reserves appears desirable, while the number obtainable from the unreserves should be ample to meet the present local demand. Therefore different felling series for reserves and unreserves are considered necessary.

487. The following statement shows the allocation of areas to each felling series :—

Felling Series.	Section.	Locality. Name.	Locality. Area.	Total area in acres.
'A'	Baindur (Reserves)	Guruvanacote	601	
		Kadike	576	
		Baindur	3,224	4,401
'B'	Baindur (Unreserves)	Shirur	487	
		Yedatare	823	
		Paduvarai	156	
		Yelajitta S. Nos. 1 and 10	166	
		Taggarshe, north of Baindur-Kolluru road.	128 } 704	
		Baindur	845	3,309
'C'	Wandse (Reserves)	Herur	1,179	
		Kursegudde	467	
		Honnakodlu, Darlegudde	496	
		Harkur, Mudarigudde	678	
		Kassankatte, Abbigudde, Talaburane	336	
		Hulimishepare	134	3,290
'D'	Wandse (Unreserves)	Taggarshe, south of Baindur-Kolluru road.	140	
		Yelajitta S. Nos. 124, 190 and 207 ..	283	
		Golihole	256	
		Kalthod	1,036	
		Ullur	409	
		Herangal	89	
		Herur	273	
		Alur	73	
		Nada	183	
		Harkur	16	
		Nujady	36	
		Wandse	124	
		Sanapura	64	2,982
				13,982

488. *The crop.*—*Acacia sundra* occurs on various geological formations and soils, but its distribution in this division is chiefly confined to exposed, poor quality, laterite soils, to which other species are less adapted. Although deep loamy soils are not actually deterrent to the development of *Acacia sundra,* its chances of surviving other fast growing competing growth are remote. In localities supporting dense tree growth of other species, *Acacia sundra* does not exist. Though a pronounced light demander in its later stages, *Acacia sundra* requires light over-head or side-shade in its infancy until the seedlings are established. Other requirements to be fulfilled for perpetuating this species are protection from fire and immunity from grazing until the seedlings develop hard protective thorns. A loosening of the soil before sowing, and weeding after the seedlings have appeared, is desirable for good results.

Acacia sundra forms the predominant species in this working circle, and in places it occurs almost pure. Its distribution is chiefly confined to the coastal reserves of Coondapoor Range. In spite of the excessive demands by the ryots for green manure leaves from these coastal reserves, *Acacia sundra* trees have been spared in the past owing to the utter uselessness of their leaves for fodder, litter or manure. It is moreover a reserved tree in South Kanara. The chief associates of *Acacia sundra* are *Strychnos nux-vomica, Careya arborea, Phyllanthus emblica, Eugenia* species, *Buchanania latifolia, Litsaea wightiana* and sandal. Its growth is better in the Wandse section than in Baindur. The average height *Acacia sundra* attains is 12 to 15 feet and it rarely grows bigger than three feet in girth. All girth classes are well represented ; trees of two feet in girth ard over are common, one to two feet are plentiful and natural regeneration is satisfactory. Undergrowth on the greater part of the area consists of xerophytic shrubs or grass, but where *Acacia* occurs in mixture with fuel species, the undergrowth consists of deciduous shrubs.

SECTION 2.—BLOCKS AND COMPARTMENTS.

489. Each reserve included in this working circle constitutes a block bearing the name of the reserve. Further subdivision into compartments is unnecessary.

Unreserves are indicated by the name of the village and survey numbers where available.

SECTION 3.—ANALYSIS AND VALUATION OF THE CROP.

490. No stock-mapping or fresh enumerations were done in this working circle by the working plans staff. Any expense incurred on detailed enumeration was considered unjustifiable in view of the present slump in the cutch trade and the difficulty experienced by the management in disposing of their annual coupes which contain large numbers of mature trees. For the purposes of this plan the stock-map and enumerations made between the years 1922–24 during the preparation of the working plan by Mr. Lazarado, have been utilized in the allocation of coupes and estimation of the yield. An abstract of the above enumerations relating to the areas included now in this working circle is given below :—

Baindur section.	Girth classes.			
	6″ to 12″	12″ to 18″	18″ to 24″	Over 24″
Kadike reserve	2,655	4,870	3,354	1,364
Baindur reserve	16,846	29,199	17,568	7,320
Guruvanacote reserve	2,901	5,507	2,861	632
Shirur unreserve	1,761	4,475	3,212	761
Yedatare unreserve	493	1,493	1,145	523
Paduvarai unreserve	767	1,005	822	478
Yelajitta unreserve	486	916	764	324
Taggarshe unreserve, north of road	8,228	11,338	5,718	1,969
Baindur unreserve	7,217	9,494	5,499	1,588
Total ..	**41,354**	**68,297**	**40,943**	**14,959**

Of the above, 7,866 trees of and above 24″ in girth were extracted between the years 1922 and 1932. The enumerations made in Baindur section in 1922 were subsequently found to be defective ; on the results of past working, it is estimated that the original enumeration was an over-estimate by 15 per cent. The number of trees in the above are accordingly reduced by 15 per cent for purposes of calculation of the possibility and the yield.

Wandse section.	Girth classes.			
	6″ to 12″	12″ to 18″	18″ to 24″	Over 24″
Herur West Reserved Forest	4,451	5,254	2,352	531
Herur East Reserved Forest	2,624	2,647	914	166
Honnakodlu Reserved Forest	1,272	1,223	322	43
Darlegudde Reserved Forest	1,862	2,530	468	99
Harkur Reserved Forest	1,170	1,319	761	376
Mudaregudde Reserved Forest	865	1,837	1,067	259
Kassankatte Reserved Forest	1,237	2,294	1,050	192
Abbigudde Reserved Forest	415	890	352	30
Talaburane Reserved Forest	195	233	107	8
Kursegudde Reserved Forest	4,065	6,373	2,202	589
Hulimishipare Reserved Forest	286	487	318	148
Taggarshe unreserve, south of road and Yelajit S. Nos. 124, 190, 207.	3,451	4,477	1,654	322
Golihole unreserve	2,215	3,021	1,168	232
Kalthod S. No. 346 unreserve	3,476	3,881	1,424	346
Kalthod balance reserve	6,779	6,059	2,095	395
Ullur unreserve	3,725	2,853	1,180	335
Heranjal unreserve	987	1,098	319	34
Herur unreserve	1,711	3,223	1,349	387
Alur unreserve	271	575	291	47
Nada unreserve	275	459	255	154
Harkur unreserve	1,170	1,319	761	376
Nujady unreserve	146	260	137	21
Wandse unreserve	237	631	491	109
Total ..	**42,885**	**52,943**	**21,037**	**5,199**

Of the above, 3,677 trees of and above 24″ girth were extracted from 1925 to 1928.

SECTION 4.—METHOD OF TREATMENT.

491. The *Silvicultural System* prescribed is the Selection System. Existing natural regeneration and regrowth from coppice after felling will be depended upon for regenerating the coupes annually felled. In addition to this artificial sowings at regular espacements on an experimental scale over a limited area of five acres annually will be done, with a view to examining the possibility of obtaining pure woods of *Acacia sundra* to be treated eventually under one of the uniform systems of management.

492. The *exploitable size* is fixed at 24 inches in girth over bark at breast-height. The following considerations have prevailed in fixing the exploitable size at the above minimum :—

(1) This size yields a high percentage of cutch and catechin. Contractors experienced in the manufacture of cutch state that trees of 18 inches in girth yield proportionately less cutch than trees of 24 inches, and there is no reason to doubt their statement. Experiments conducted by the Forest Chemist at Dehra Dun indicate that ageing of *Acacia sundra* trees results in the decrease of cutch, and that the tree is probably unsuited for the manufacture of cutch above a girth of 36 inches at breast-height.

(2) The coppicing capacity of *Acacia sundra* is most satisfactory when the tree is about 24 inches in girth and, so far as our present experience shows, decreases with trees of bigger girth.

493. The *rotation* will be 28 years. Ring countings made in the Baindur Block in 1923–24 over 675 trees (vide paragraph 280) indicate that it takes 28 years for a seedling of *Acacia sundra* to attain the exploitable size of 24 inches in girth at breast-height. A shorter rotation may be feasible under more systematic intensive treatment of this species in pure woods.

494. The *felling-cycle* will be seven years. The average annual girth increment of *Acacia sundra* is 6/7ths of an inch (vide paragraph 280), and at the end of one felling cycle trees at present in the class immediately below the exploitable size, viz., 18 to 24 inches class, will be ready for extraction.

495. *Coupes*.—Each felling series is divided into seven annual coupes which are shown in the plan accompanying this report. The areas allotted to each coupe are shown in the tabular statement of fellings, given in section 6 below.

496. *Possibility*.—From the abstract of enumerations given in section 3, after making a deduction of 15 per cent for overestimate in the enumerations of Baindur section, the distribution of trees under each girth class would be as follows :—

Section.	Girth classes.			
	6″ to 12″	12″ to 18″	18″ to 24″	Over 24″
Baindur	35,152	58,254	34,802	12,816
Wandse	42,885	52,943	21,037	5,199
Total ..	**78,037**	**111,197**	**55,839**	**18,015**

A period of 21 years is necessary for a tree of six inches in girth to attain a girth of 24″ (vide paragraph 280). On the assumption which is considered reasonable, that 50 per cent of the trees in the 6″ to 12″ girth class, 75 per cent of the trees in the 12″ to 18″ class and 90 per cent of the trees in the 18″ to 24″ class will survive the period of 21 years, the total number of trees to attain exploitable dimensions during the above period will be

50 per cent of 78,037 =	39,018	trees.
75 per cent of 111,197 =	83,397	„
90 per cent of 55,839 =	50,255	„
Add trees which were exploitable at the time of enumeration. =	18,015	„
Total ..	**190,685**	„

Therefore the possibility based on the present growing stock is $\frac{190,685}{21} = 9,080$ or roughly 9,100 trees per annum which is the average annual yield prescribed during the period of this working plan.

497. *Yield*.—The annual yield will be regulated by number of trees with an area check. In the yield calculations it is assumed that 90 per cent of the trees which were in the 18″ to 24″ girth class at the beginning of the first felling cycle in 1925 would become exploitable at the commencement of the next felling cycle, i.e., in 1932, and that 75 per cent of the trees which were in the 12″ to 18″ class at the beginning of the first felling cycle in 1925 would be ready for extraction at the commencement of the third felling cycle, i.e., in 1940. The anticipated annual yield from each coupe is given in section 6, the tabular statement of fellings.

In instances where difficulty was experienced in allotting definite areas to each annual coupe, two adjacent coupes have been clubbed together to be worked in two successive years. This is again referred to in paragraph 500.

SECTION 5.—EXPLOITATION.

498. Reference has already been made in paragraph 250 to the fact that there is little demand for cutch from South Kanara, and the District Forest Officer has forwarded this year samples of pure cutch to various private merchants as well as to the Forest Utilization Officer in Madras, to ascertain what demand there is likely to be for the product. Until trade conditions revive, or a foreign market is secured, it is not possible to foresee whether the management will be able to dispose of their large stock of *Acacia sundra* trees which, if left unfelled for ten years or more, may prove useless for the manufacture of cutch. Every endeavour should therefore be made by the management to dispose of the mature and over-mature stocks in the coupes even though the trees cannot be sold so profitably as in times of prosperity.

499. *Marking* shall be done according to the following rules :—

(1) Marking shall be done by a subordinate not below the rank of a permanent forester ;

(2) Before commencing marking, the coupe shall be divided into three or four convenient strips, and enumeration records shall be kept separately for each strip ;

(3) Marking, as also felling, shall be completed in one strip before proceeding to another ;

(4) Marked trees shall be serially numbered with tar in two places ; one at about four feet from the ground level and the other on the stem as close to the ground as possible. After a tree is felled, the stump shall be hammer-marked by the subordinate in charge ;

(5) The serial number of the tree and its girth at breast-height shall be recorded in the appropriate columns of Form 3 at the time of marking. When a tree is felled, the length of its utilizable bole containing heartwood and its mid-girth shall be recorded in red ink below the entries already made in Form 3, with a view to ascertaining the quantity of wood obtained for distillation ;

(6) Marking shall be completed before the commencement of the south-west monsoon ;

(7) Not less than 20 per cent of the trees marked in each strip shall be checked by the Range Officer, and 10 per cent of the total number of trees marked shall be checked by the District Forest Officer.

500. *Disposal of the trees.*—The trees marked in one coupe of each of the felling series shall be annually advertized for sale in public auction in the month of August. The successful contractor will do the felling and coppicing in accordance with the conditions of the agreement now in force in the division. In a few cases it has been found impossible to indicate on the map the precise limits of the annual coupe as the location of the trees at the time of the original enumeration is not clear, and the *yield* cannot therefore be correctly allocated. In such cases two coupes prescribed for exploitation during two successive years have been shown together. In the year the first of the two coupes is due for sale, the District Forest Officer shall cause a complete enumeration to be made of all exploitable trees over the entire area, and then divide it into two coupes of equal annual yields. It will be convenient if the same contractor agrees to work both the coupes, in which case the lease can be extended to cover two years.

501. It has been the custom to allow three acres of wooded land in unreserves in the vicinity of each cutch still for the supply of fuel to the stills. This may be continued.

502. *Departmental manufacture.*—The local method of manufacturing cutch is to adulterate it with wood ash which gives probably the consistency required by the demand in Hassan, Mysore. Local contractors have not hitherto succeeded in securing a foreign market nor have they the resources to undertake the large financial outlay involved in such a venture. Therefore it is suggested that, should the enquiries of the District Forest Officer regarding the marketing of cutch show that a profitable foreign market can be secured, and should no contractors come forward to undertake the supply on reasonable terms, he may, with the previous approval of the Conservator of Forests, arrange for the manufacture of cutch departmentally, acting on instructions from the Forest Utilization Officer. It would be advisable to secure forward contracts before undertaking departmental manufacture.

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503. SECTION 6.—TABULAR STATEMENT OF FELLINGS.

BAINDUR SECTION.
Felling Series ' A ' (Reserved Forest).

Year of felling. (1)	Coupe number. (2)	Name of Block. (3)	Area of coupe in acres. (4)	Yield in number of trees. (5)
		First Felling Cycle.	ACS.	
This being a 'Reserve Felling Series' it will be opened for extraction only when the demand for cutch increases; so no years are specified.	I	Guruvanacote	601	2,670
	II	Kadike	576	3,600
	III	Baindur Part	614	2,500
	IV	Do.	473	2,900
	V	Do.	934	3,100
	VI	Do.	499	2,650
	VII	Do.	704	3,020
		Second Felling Cycle.		
	I	Guruvanacote	601	3,510
	II	Kadike	576	3,100
	III	Baindur Part	614	2,200

BAINDUR SECTION.
Felling Series ' B ' (Unreserved Forest).

Year of felling. (1)	Coupe number. (2)	Name of Village. (3)	Area of coupe in acres. (4)	Yield in number of trees. (5)
		First Felling Cycle.	ACS.	
1932–33	I	Shirur	487	2,550
1933–34	II	Yedatare and Paduvarai	979	2,500
1934–35	III	Yelajitta and Taggarshe to the north of Baindur-Kolluru road, and east of Hosieri river.	294	2,160
1935–36 and 1936–37	IV and V	Taggarshe to the north of Baindur-Kolluru road and to the west of Hosieri river.	704	4,550
1937–39	VI and VII	Baindur	845	4,300
		Second Felling Cycle.		
1939–40	I	Shirur	487	2,850
1940–41	II	Yedatare and Paduvarai	979	1,910
1941–42	III	Yelajitta and Taggarshe to the north of Baindur-Kolluru road, and east of Hosieri river.	294	2,380

WANDSE SECTION.
Felling Series ' C ' (Reserved Forest).

Year of felling (1)	Coupe number. (2)	Name of Block. (3)	Area of coupe in acres. (4)	Yeild in number of trees. (5)
		First Felling Cycle.	ACS.	
This being a 'Reserve Felling Series,' it will be opened for extraction only when the demand for cutch increases; so no years are specified.	I and II	Herur West	729	2,600
	III	Herur East, Honnakodlu and Darlegudde.	946	1,680
	IV	Harkur and Mudaregudde	678	1,650
	V	Kassankatte, Abbigudde and Talaburane.	336	1,340
	VI and VII	Hulimishepare and Kurseguddo.	601	2,400
		Second Felling Cycle.		
	I and II	Herur West	729	3,940
	III	Herur East, Honnakodlu and Darlegudde.	946	4,800

WANDSE SECTION.
Felling Series ' D ' (Unreserved Forest).

Year of felling. (1)	Coupe number. (2)	Name of village. (3)	Area of coupe in acres. (4)	Yield in number of trees. (5)
		First Felling Cycle.	ACS.	
1932–33	I	Taggarshe. south of Baindur-Kolluru road and Yelajitta.	423	1,780
1933–34	II	Golihole	256	1,260
1934–36	III and IV	Kalthod	1,036	4,000
1936–37	V	Ullur and Heranjal	498	1,650
1937–38	VI	Herur and Alur	346	1,520
1938–39	VII	Nada, Harkur, Nujady and Wansde.	423	1,480

WANDSE SECTION—*cont.*
Felling Series 'D' (Unsererved Forest)—*cont.*

Year of felling. (1)	Coupe number. (2)	Name of village. (3)	Area of coupe in acres. (4)	Yield in number of trees. (5)
		Second Felling Cycle.	ACS.	
1939–40	I	Taggarshe. south of Kolluru-Baindur road and Yelajitta.	423	3,350
1940–41	II	Golihole	256	2,270
1941–42	III	Kalthod Part	..	2,900

SECTION 7.—REGENERATION.

Natural.

504. Existing natural seedling regeneration, and coppice regrowth from felled trees will be relied upon for regenerating the coupes.

505. No tending is prescribed for *Acacia sundra* in unreserves. When the coupes in the 'Reserve Felling Series' A and C are worked a tending consisting of climber-cutting combined with a thinning of the coppice shoots where necessary will be done in the third year after felling. All *Acacia sundra* trees, seedlings and coppice shoots in such felled coupes shall be freed of all interfering climbers and creepers. A thinning of coppice shoots will at the same time be made with the object of encouraging one or two of the more promising shoots at the expense of the less vigorous ones.

Artificial.

506. About 100 to 150 acres considered suitable for the concentrated regeneration of *Acacia sundra* are available in the western part of Herur reserve, outside the Fuel Felling Series and adjoining the existing *Acacia* plantation. In this locality an area of fifty acres, more or less in the form of a square, shall be selected by the District Forest Officer and treated in the manner prescribed below.

507. Annually five acres shall be artificially regenerated with *Acacia sundra*; if after five years of this plantation work the demand for cutch does not show signs of improvement the remaining area selected for plantation will not be regenerated, but the twenty-five acres already planted will be carefully tended as prescribed below. If the demand for cutch is, however, increasing, a similar area will be regenerated annually for the remaining five years of the period.

508. *Seed collection.*—*Acacia sundra* seeds well every year. The seeds ripen on the trees in February-March. Fresh mature pods should be collected from the trees and allowed to dry in the sun for a few days. The seeds after they are dry should be carefully stored as they are subject to insect attack. Four pounds by weight of dry seeds would be sufficient to sow one acre at an espacement of 12 feet by 12 feet.

509. *Preparation of the area.*—Annually five acres in the area selected shall be laid out and surveyed by the Range Officer in the month of February, and demarcated by a cleared line 15 feet wide. Wooden boards shall be fixed at the corners of the coupe indicating the area of the coupe and the year of formation. The periphery of the coupe shall be fire-traced in March.

510. The *espacement* will be 12 feet by 12 feet.

511. *Aligning and staking* the area shall be done in the month of April in accordance with the instructions contained on pages 40 to 43 of the Madras Forest Pocket Book.

The soil at each stake shall be loosened to a depth of 4 to 6 inches over a diameter of 2 feet.

512. *Sowing.*—About 80 to 100 seeds of *Acacia sundra* shall be sown in each prepared patch in the first week of May, and lightly covered with earth. Earlier sowing may be preferable, but it is apperhended that the seeds, if allowed to remain in the ground for a long time, may be attacked by insects. Direct sowings have proved satisfactory so far and will, therefore, be continued, until it is definitely established that any other method is more efficacious.

513. *Fencing.*—The regeneration area shall be substantially fenced all round with stout wooden posts and brushwood and thorns as soon as the sowing has been completed. Material for the fence can be obtained by felling trees and collecting brushwood from the boundary of the regeneration area. Small trees may also be felled inside the regeneration area itself so as to leave an even distribution of tree growth. The fence shall be maintained in good repair for a period of five years from the year of formation. It is considered unnecessary to mantain the fence for a longer period as the *Acacia* seedlings acquire natural immunity from cattle and deer by the development of hard thorns in the third or fourth year after sowing.

514. *Nursery.*—A small permanent nursery consisting of 3 to 4 beds of 40 feet by 4 feet shall be maintained in the vicinity of the planting area for purposes of replacing casualties. The nursery shall be formed under the light shade of trees. The site should be dug up to a depth of one foot and all roots and stones should be eliminated from the soil. A path 1½ feet wide shall be left all round each bed. The nursery site shall be strongly fenced with stout wooden posts, brushwood and thorns.

Broken pods or clean seeds shall be sown in the nursery in the month of April, and watered. Germination commences within a few days of sowing and continues for a couple of months. No special preparation of the seed is essential, as it germinates freely, but soaking in water for 24 hours before sowing produces almost cent per cent success. Soaking is therefore prescribed.

After the seedlings have appeared, the nursery beds shall be kept continuously weeded and the soil loosened.

SECTION 8.—SUBSIDIARY SILVICULTURAL REGULATIONS.

515. The following silvicultural operations are prescribed for the new plantations as well as for such of those existing plantations (vide paragraphs 252—257), that may need tending.

516. *Weeding.*—Weed growth in the area recommended for concentrated regeneration is little. As a general rule weedings shall be done as often as the District Forest Officer considers it necessary, and when done the operation should be a thorough one. It is, however, suggested that two weedings may be necessary in the first two years and one weeding in the third year. Of the two weedings in the first year, the first one shall be a clear weeding with mammutties 1½ feet all round the plants to be performed in the month of July, and the second weeding shall be done in the month of October combined with soil working around the plants. In the second year two weedings may be necessary on the same lines as those indicated for the first year. One weeding may be necessary in the third year especially around the backward plants.

517. *Replacement of casualties* shall be done in the monsoon following the year of formation with nursery transplants.

518. *Removal of overwood* is a matter which can be decided only on experience gained in the course of the next few years. It is, however, suggested that the entire removal of the overwood may be necessary in the seventh year of the plantation. The advice of the Provincial Sulviculturist should be obtained when he next visits the District.

519. *Thinnings.*—The espacement adopted being 12 feet by 12 feet it is not anticipated that any thinnings will be required during the period of the plan.

520. *Fire protection.*—All plantations in this working circle shall be rigidly fire-protected by cutting and burning a fire line 20 feet wide all round the plantations. Internal lines shall be fire-traced to a width of 10 feet only (vide paragraph 578).

521. *Concessions.*—All plantations under this working circle shall be closed to the exercise of the special concessions of South Kanara.

522. *Grazing.*—Grazing will not be allowed for a period of five years from the year of formation.

SECTION 9.—CONTROL.

523. The following Control Records shall be maintained :—
The Control Book,
The Record of Works,
The Control Journal,
The Regeneration Register,
The Control Maps.

Sample entries for the Control Book, and the Record of Works are given in Appendix II. The Control Journal shall contain all relevant information regarding the growth of *Acacia sundra.*

A Control Map shall be maintained on a scale of 1 inch to 1 mile showing the areas worked annually. In addition, a plan of the area regenerated artificially every year to a scale of 4 inches to one mile shall be maintained.

CHAPTER VIII.—WORKING PLAN FOR THE SANDAL WORKING CIRCLE.

SECTION 1.—GENERAL CONSTITUTION OF THE CIRCLE AND CHARACTER OF THE VEGETATION.

524. All reserves containing sandal, and all village lands where sandal is present either in unreserves, kumakis or patta lands, are included in this working circle. The general distribution of sandal is irregular and all degrees of density from scattered to moderately

dense, are represented. The species is confined to the thinly wooded, coastal and plains reserves and village lands of the division. It is conspicuously absent from the foot-hill and ghat portions of the division, along margins of principal rivers and in localities where the tree canopy is dense. Sandal occurs largely in degraded timber areas of the deciduous type, in open scurb type of forest, and at the heads of minor streams and valleys which contain mediocre but not heavy vegetation. Generally, the main habitat of sandal may be said to be village lands, which are remote from the important reserves of the division, and in a few minor reserves adjoning villages such as Nire, Vorwady, Todar, Mavinaguli, etc. Under normal circumstances it would be desirable to form a separate working circle for the sandal in reserved forests, but in view of the smallness of the area involved when compared to the extent of the village lands, it was considered unnecessary to form a separate working circle for Reserve sandal. In South Kanara sandal is not essentially a forest tree and consequently it has received little systematic attention from the Forest Department. Owing to the diffuse nature of the distribution of sandal in lands which are remote from the reserved forests of the division, and which are not under the direct administrative control cf the District Forest Officer, no detailed stock-mapping or valuation of the sandal in unreserves was undertaken. The distribution of sandal in the reserves has been shown on the stock-maps that accompany this plan. With the data available from past exploitation operations in the unreserves, the sandal bearing areas have been indicated, as far as possible, on the plans submitted with this report. It is possible, that certain village lands outside the limits of the working circle, as at present shown on the maps, may be found to contain sandal on closer investigation. Such lands should also be brought under exploitation and the procedure to be followed in such cases is prescribed in a later paragraph. Therefore, this working circle is elastic and is susceptible of addition of further sandal areas should any be found outside the villages already indicated.

Village lands included in this working circle may be classified under the following categories :—

(*a*) Unreserves,
(*b*) Kumaki lands, and
(*c*) Patta lands.

The proprietary rights of Government over sandal in unreserves and kumaki lands are absolute. But in the case of kumaki lands a concession has been extended to the kumakidar in G.O. No. 1461 (Development), dated 4th November 1922, whereby a remuneration of one-third of the value at the seigniorage rates in force, for the sandal trees extracted by the Department, is to be paid to the kumakidar for the trouble he has taken in protecting the trees till they are exploited by the Forest Department. On patta lands sandal trees are the absolute property of the pattadars.

525. The total area of this working circle as at present constituted is 175,026 acres, of which 4,438 acres represent sandal reserves. The following table shows the allocation of areas to the working circle.—

Felling Series number.	Range.	Reserved forests. Name.	Reserved forests. Area in acres.	Village lands. Taluk.	Village lands. Area in acres.	Total area in acres.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			ACS.		ACS.	ACS.
I	Mangalore ..	Hosabettu and Todar.	869	Mangalore and part of Karkal.	72,136	73,005
II	Udipi	Nire and Vorwady	1,542	Udipi and part of Karkal.	53,426	54,968
III	Shankaranarayana and Coondapoor.	Mavinaguli and Kassankatte.	2,027	Coondapoor ..	45,026	47,053
		Total ..	**4,438**		**1,70,588**	**1,75,026**

526. *Felling Series.*—Three felling series have been constituted, designated I, II and III. The absence of adequate data precludes possibilities of further division into felling series.

527. Sandal occurs in mixture with fuel species in scrub type of forest. It grows on poor, exposed laterite soils devoid of humus, but better development is attained in light, moderately deep, loamy soils with an admixture of small boulders. Sandal does not appear to thrive in moist situations. Its principal associates are *Terminalia paniculata, Terminalia tomentosa, Careya arborea, Eugenia* species, *Buchanania latifclia, Litsaea Wightiana, Aporosa lindleyana, Strychnos nux-vomica, Acacia sundra,* etc. Most of the sandal found in the division is in the sapling stage. It rarely attains to more than 36 inches in girth and to more than 25 feet in height in this division. Many of the saplings look unhappy probably due to ill-treatment in the past, and the absence of adequate shade against the afternoon

sun. Saplings are noticed drying up at the top, and the side of the stem most exposed to the afternoon sun gets cracked ; such saplings do not probably put on growth on that side. Natural regeneration is poor. The best growth of sandal is found in Hosabettu and Mavinaguly reserves.

SECTION 2.—BLOCKS AND COMPARTMENTS.

528. Each felling series is divided into six annual coupes as shown on the plans accompanying this report. Areas in sandal bearing reserves which are includedi n this working circle have been divided into three compartments in each felling series for purposes of tending and improving the stock of sandal (vide paragraph 541). Wooden boards showing the compartment number and its area shall be planted at the corners of each compartment.

The unreserves and patta lands are designated by the name of the village in which they are situated.

SECTION 3.—ANALYSIS AND VALUATION OF THE CROP.

529. For reasons already alluded to, no enumeration or detailed stock-mapping of the sandal areas was undertaken during the preparation of this plan. With the limited staff available it was only possible to make a brief reconnaissance of the vast area involved. The sandal areas in reserves were stock-mapped by the working plan staff.

SECTION 4.—METHOD OF TREATMENT.

530. A brief outline of the policy of the Department in the past is essential for a comprehensive understanding of the method of treatment prescribed in the following paragraphs :—

It is acommon practice for private merchants to transport sandalwood from Mysore and Coorg to South Kanara for the purpose of distillation of the essential oil ; this has afforded in the past facilities for sandal thieves to remove illicitly large quantities of sandal from the Government lands of the district. Further, legitimate purchases of sandal in patta lands has also been used as a cloak for the theft of Government sandal especially from unreserves.

In 1915 special rules for the transit of sandal in South Kanara were introduced. These rules, however, sought merely to control the movement of sandalwood and were not concerned with the prevention of illicit felling in unreserves, the protection of which is vested in the Revenue Department. Large scale thefts have continued in spite of the special transit rules.

In 1922, on the recommendation of the Chief Conservator of Forests, Government approved the policy of encouraging sandal in kumaki lands and ordered, in G.O. No. 1461 (Development), dated 4th November 1922, the grant of remuneration to kumakidars for fostering the sandal trees till they were exploited by the Forest Department.

In 1925, the kumakidars represented that the responsibilities attendant on them in the conservation of sandal on kumaki lands were a serious burden. On the recommendation of the Chief Conservator of Forests, Government, in their order Mis. No. 891 (Development), dated 18th June 1925, considered it inadvisable to continue the policy of encouraging sandal in kumaki lands and directed that sandal trees on such lands should be uprooted and sold in auction. The Chief Conservator, however, ordered that trees that did not contain heartwood need not be uprooted. Consequently, from 1925 extraction of sandal from unreserves and kumakis was confined to trees of and above 10 inches in girth, it being presumed that trees below 10 inches do not contain heartwood.

The control of private sandal was never attempted by the Department in the past ; therefore no patta sandal extraction was undertaken.

Until 1925 no tree value on sandal was collected from kumaki lands assigned on patta although the sandal trees on kumakis are the absolute property of the State. After 1925 it was the practice to recover two-thirds of the value of the sandal trees at seigniorage rates on lands assigned on patta. At the instance of the District Forest Officer and the Collector, Government in their order No. 885 (Revenue), dated 19th April 1928, approved the recommendation of the Board of Revenue that this practice should be regularised.

The seigniorage rates referred to in the G. O. No. 1461 (Development), dated 4th November 1922, were revised in Chief Conservator's Proceedings No. 663, Mis., dated 27th December 1930, and 150, Mis., dated 13th April 1931, in consultation with the Collector. These rates were based on the actual heartwood contents of the trees extracted in the past and their net money value after deducting cost of marketing.

531. It will thus be seen that till 1930, when the present Chief Conservator modified the policy, it had been the practice of Government to alienate sandal trees on lands assigned on darkhast. The recognition of private rights to sandal has been an important factor in the increase of sandal smuggling in the district. In order to prevent theft, the Chief Conservator of Forests, in 1930 decided to put an end to the practice of allowing darkhastdars to purchase sandal from Government on darkhast lands and ordered the removal of all sandal trees on such lands before assignment (vide Chief Conservator's Proceedings Mis. No. 663, dated 27th December 1930, as modified by Chief Conservator's Proceedings Mis. No. 150, dated 13th April 1931). This order prescribed that the policy to be adopted was to remove through the agency of the Forest Department, *all* sandal on kumaki lands to be assigned on patta, though a scale of seigniorage rates to be adopted was fixed to cover cases where it might not be possible or desirable to remove the sandal trees prior to assignment.

532. While it has been the policy in South Kanara to allow pattadars to acquire possession of sandal trees in patta lands, in other and more important sandal districts, it has always been the intention of Government to reserve to themselves the ownership of sandal trees in assigned lands. In G.O. No. 1290, Revenue, dated 16th June 1928, Government have made the reservation of existing and future sandal trees, a condition of the grant of land in certain special sandal tracts. It would be desirable to extend the operation of the Government Order to South Kanara, so that, in the future, the existence of privately owned sandal may not embarass Government.

533. The following is a brief analysis of the legal points relating to sandal on different classes of lands in this division :—

(1) Government hold absolute ownership of all sandal trees on reserves and unreserves.

(2) All sandal trees on kumaki lands are the absolute property of the State, but when extraction of sandal is undertaken by the Forest Department the kumakidar is to be remunerated at one-third of the seigniorage rates on all sandal trees containing heartwood as ordered in G.O. No. 1461, Development, dated 4th November 1922. The seigniorage rate has been revised in Chief Conservator's Proceedings Mis. No. 150, dated 13th April 1931.

(3) When kumaki lands containing sandal are assigned on darkhast, the Forest Department may extract all the sandal trees before assignment and pay the kumakidar compensation according to the rates laid down by the Chief Conservator of Forests from time to time.

(4) On patta lands Government have *at present* no right over sandal trees.

534. *Outline of future policy.*—The following considerations indicate the advisability of continuing the policy adopted since 1925-26, viz., that of removal of all sandal trees containing an appreciable quantity of heartwood from unreserves and kumakis :—

(1) Such lands are not under the direct administrative control of the Forest Department.

(2) Silvicultural operations should not be undertaken on village lands which are primarily reserved for the benefit of the villagers. The Department must therefore be content with exploiting the sandal which nature has provided in the villages.

(3) South Kanara is not essentially a sandal district. Sandal occurs scattered over the waste lands and kumakis of the more open type of forest remote from the reserves and it is not the function of the Forest Department to attempt to protect or foster the sandal trees on such lands.

(4) The presence of private sandal oil stills in the district provides an incentive, and the existence of privately owned and patta sandal serves as a convenient cloak, for the illicit removal of Government sandal. To prevent theft the only effective method seems to be to remove *all* exploitable sandal that is under the direct control of the Forest Department ; this should include all sandal on patta land as well as in unreserves and kumakis.

Conservation of the existing sandal trees in reserves, and improving the existing stock by systematic tending is essential.

Therefore the objects of future management should be—

(1) to extract systematically all sandal trees of and above a prescribed girth limit from unreserves and kumaki lands,

(2) to remove dead trees from reserves and to tend the existing sandal,

(3) to purchase, if possible as a measure of protection, all sandal trees containing heartwood on patta lands under suitable agreements, and

(4) to remove from darkhast lands, prior to assignment, all sandal trees containing heartwood that it is profitable to extract, and thereafter to remove sandal growth thereon, from time to time, as it becomes economically exploitable.

535. *Prescriptions.*—No living trees shall be extracted from reserves ; only dead trees shall be extracted.

In unreserves and kumaki lands all living sandal trees of and above a girth of 10 inches, and all dead trees and stumps containing heartwood, shall be extracted. For sandal trees containing heartwood extracted from kumaki lands remuneration shall be paid to the kumakidar according to the rates laid down by the Chief Conservator of Forests from time to time. A girth limit of 10 inches is adopted as it is the estimated minimum size which will yield heartwood that can be extracted economically.

Attempts should be made to purchase sandal trees containing heartwood on patta lands when the owner (and care must be exercised to ensure that the trees are privately owned) desires to exploit them. The most satisfactory plan will be to ascertain what of such trees exist and to enter into agreements with the owners providing for extraction by the Forest Department upon terms to be mutually agreed upon. The basis of payment will be the rates obtained for departmentally exploited wood less the actual cost of extraction less 5 per cent of the gross sale-proceeds. Notice of the policy adopted should be announced from time to time in the District Gazette when it is likely to be found that private owners will prefer to sell to the Department rather than to private dealers. Exploitation of such trees must be when it is desired by the private owner, proper accounts must be rendered to him and payment which should be as promt as possible, should be made by the District Forest Officer.

In sandal bearing unreserve lands all the sandal trees containing heartwood that it is profitable to extract shall be removed by the Forest Department, before the land is assigned on darkhast. When kumaki lands containing sandal are assigned the Forest Department shall similarly, before assignment, remove all sandal trees containing heartwood that it is profitable to extract and pay the kumakidar compensation according to the rates laid down by the Chief Conservator of Forests from time to time. Thereafter the Forest Department shall remove sandal growth thereon, as it becomes economically exploitable. The Collector will give the District Forest Officer timely notice of application for the assignment of kumaki or unreserve lands containing sandal, so that the District Forest Officer may arrange to remove the sandal trees before the lands are assigned (vide Board of Revenue Reference B. No. 1362-29-5, dated 6th November 1929).

536. *Felling cycle.*—To meet the conditions in South Kanara an annual felling cycle would be ideal so that the whole area might be gone over every year. The scattered nature of the sandal, which covers vast areas of village lands has, however, necessarily led to the adoption of a longer felling cycle. A felling cycle of six years is, therefore, prescribed.

537. *Coupes.*—Each felling series is divided into six annual coupes which are shown in the plans accompanying this report. The distribution of areas to each coupe is shown in the statement under section 6.

538. *Yield.*—The working will be regulated by area. As no enumerations were made in the sandal bearing areas, no accurate forecast of the annual yield can be made. However, an approximate forecast of yield, based on the results of past working, is given in the statement in section 6, to serve as a *very rough guide*, on which the management may base their annual estimates.

SECTION 5.—EXPLOITATION.

539. All sandal trees of and above the girth limit prescribed for village lands, and all dead trees and stumps containing scented wood shall be extracted and disposed of in accordance with the rules published in 1930, regarding the selection, felling, cleaning, classification and disposal of sandalwood and the method of maintaining depot accounts and other registers, in Madras Presidency, subject to the special prescriptions laid down in this plan and subject to the condition that the special method of classification adopted in South Kanara shall be continued.

One coupe shall be worked every year in the sequence laid down in the statement of fellings given below. All unreserves and kumaki lands included within the annual coupe, and all patta lands which are situated in the annual coupe and in respect of which agreements have been executed, shall be exploited in the year the coupe is due for felling. Should the area of the annual coupe be found too large for working, it may be divided into a suitable number of sub-coupes. Enumeration records shall be maintained separately for each sub-coupe as well as for kumaki lands and each survey number of patta lands.

Patta lands or unreserves containing sandal, which are outside the limits of the working circle as shown at present in the maps, shall be included for extraction by allocating such areas to one or more conveniently situated coupes at the discretion of the District Forest Officer.

All lands which are newly proposed for assignment, if they contain sandal, shall be gone over by the Forest Department and all sandal trees on them containing heartwood shall be extracted before assignment, irrespective of whether such lands occur within the annual coupe or not. In the case of lands for assignment which lie outside the annual sandal coupe, the District Forest Officer shall make such arrangements as are necessary to have the sandal trees extracted at once. It is not anticipated that there will be so many new assignments of lands in anyone year as to make the extraction work complicated.

The District Forest Officer shall take immediate steps to address the Collector, on the subject of the execution of the agreements referred to above in respect of sandal on patta lands.

540. SECTION 6.—TABULAR STATEMENT OF FELLINGS.

Year	Coupe number.	Range.	Area allotted to each coupe.			Forecast of yield in tons.
			Taluk.	Village. Number.	Village. Name.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Felling Series I.			
1932–33	I	Mangalore ..	.. Karkala	54	Tonkamijar	
				56	Iruvail	
			Mangalore	36	Mucharu	
				37	Kompadavu ..	2
				38	Badagaedapadavu.	
				118	Karpe	
				40	Mudaperar	
1933–34	II	Mangalore ..	.. Mangalore	41	Paduperar	
				65	Bajape	
				43	Permude	
				44	Kuttyatturu ..	
				42	Tenkaekkaru ..	
				..	Delantabetu ..	2
				35	Badagaekkaru ..	
				34	Kondemula ..	
				32	Mennabettu ..	
				31	Aikala	
				16	Talipadi	
				28	Ulipadi	
1934–35	III	Mangalore ..	.. Mangalore	..	Tiruvail	
				88	Derebail	
				59	Kavur	
				75	Mudushedde ..	
				77	Pachenadi	
				78	Kudupu	
				103	Nirmarga	2
				96	Munnur	
				..	Ambalamogar ..	
				100	Harikala	
				101	Pavur	
				173	Kurnadu	
				172	Phajiru	
				98	Konnaje	
1935–36	IV	Mangalore ..	.. Mangalore	162	Goltamajlu ..	
				158	Baltila	
				144	Kavalapadur ..	
			Karkala	82	Mudakodi	
				103	Nalkur	
				104	Balaya	
				100	Badagaekarudu ..	
				101	Pullya	
				102	Kudyadi	
				96	Navar	
				98	Shirulal	
1936–37	V	Mangalore ..	.. Karkala	57	Buchmogar.. ..	
				58	Hosabettu	
				55	Todar	
				51	Badagaemijar ..	
				50	Puttige	2
				59	Prantya	
				60	Marpadi	
				48	Beluvar	
					Todar and Hosa bettu reserves.	
1937–38	VI	Mangalore ..	.. Karkala	47	Kantavara	
				49	Paladka	
				45	Bola	2
				46	Kadandale	
				52	Kallamadukur ..	
				53	Niddodi	
1938–39	I	..	..	..	..	1
1939–40	II	..	..	..	..	1
1940–41	III	..	..	..	..	1
1941–42	IV	..	..	..	..	1

Year. (1)	Coupe number. (2)	Range. (3)	Area allotted to each coupe. Taluk. (4)	Village. Number. (5)	Village. Name. (6)	Forecast of yield in tons. (7)
			Felling Series II.			
1932–33	I	Udipi	Udipi	7	Karkada	½
				17	Heradi	
				16	Hanehalli	
				56	Matapadi	
				55	Chantara	
				48	Cherkadi	
				53	Arur	
1933–34	II	Udipi	Udipi	50	Havanje	½
				51	Uppur	
				66	Tenkanadiyar ..	
				77	Shivalli	
				44	Anjara	
				43	Bommarabetta ..	
					Nire reserve ..	
1934–35	III	Udipi	Udipi	83	Pernankila	½
				89	Belle	
				94	Inanje	
				107	Paduru	
				91	Sirva	
				..	Nire and Vorwady reserves.	
1935–36	IV	Udipi	Udipi	109	Kuttyaru	½
				110	Pillara	
				104	Elluru	
			Karkala	41	Suda	
				42	Belmannu	
1936–37	V	Udipi	Karkala	40	Palli	½
				39	Kalya	
				38	Nitte	
				37	Sanuru	
1937–38	VI	Udipi	Udipi	35	Nalkuru	½
				31	Hiliyana	
				30	Avarshe	
				29	Vandar	
				27	Kakkunje	
				28	Haladi	
1938–39	I	..	..	..	..	¼
1939–40	II	..	..	..	..	¼
1940–41	III	..	..	..	..	¼
1941–42	IV	..	..	..	..	¼
			Felling Series III.			
1932–33	I	Shankaranarayana.	Coondapoor ..	Not available.	Haladi	1
				,,	Hardallimandali ..	
				,,	Malahalli	
1933–34	II	Shankaranarayana.	Coondapoor ..	,,	Kulanji	1
				,,	Shankaranarayana.	
1934–35	III	Shankaranarayana.	Coondapoor ..	,,	Davalakonda ..	1½
				,,	Kanyana	
				,,	Kenchanur ..	
				,,	Guluvady	
1935–36	IV	Shankaranarayana.	Coondapoor ..	,,	Kavaradi	1½
				,,	Karkunje	
					Mavinguly reserve.	
1936–37	V	Coondapoor ..	Coondapoor ..		Wandse	3
					Chittur	
					Bellal	
					Kassankatte reserve.	
1937–38	VI	Coondapoor ..	Coondapoor ..	Not availabe.	Hebbige	3
				,,	Kotishirur ..	
				,,	Nagodi ..	
1938–39	I	..	..	,,	..	½
1939–40	II	..	..	,,	..	½
1940–41	III	..	..	,,	..	½
1941–42	IV	..	..	,,	..	½

SECTION 7.—SILVICULTURAL REGULATIONS.

541. In view of the policy of Government not to encourage sandal in village lands, tending in the unreserves of this working circle is not prescribed.

Sandal occurs diffusely in some of the reserves, e.g., Chittur, Talaburane, Nujinane which are included in the Fuel Working Circle. Therein the object is not to encourage the increase in the stock of sandal but to give some tending to the existing promising trees till they are exploited. Therefore, tending on the lines indicated below, shall be done by the beat guards, once in three years. The areas involved are small and the growth of sandal is scattered.

Sandal occurs in some profusion in some of the reserves which are not included in the Fuel Working Circle but which have been included in the felling series prescribed for exploitation. Such reserves in each felling series have been divided into three compartments for tending on a three-year felling cycle in the sequence indicated below :—

Year.	Felling Series I.			Felling Series II.			Felling Series III.		
	Compartment number.	Reserve.	Area in acres.	Compartment number.	Reserve.	Area in acres.	Compartment number.	Reserve.	Area in acres.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1932–33	I	Todar ..	145	I	Vorwady	401	I	Kassankatte ..	255
1933–34	II	Todar ..	192	II	Vorwady	422	II	Mavinaguli ..	362
1934–35	III	Hosabettu	325	III	Nire ..	562	III	Mavinaguli ..	257
1935–36	I	..	..	I	..	..	I	..	..
1936–37	II	..	..	II	..	..	II	..	..
1937–38	III	..	..	III	..	..	III	..	..
1938–39	I	..	..	I	..	..	I	..	..
1939–40	II	..	..	II	..	..	II	..	..
1940–41	III	..	..	III	..	..	III	..	..
1941–42	I	..	..	I	..	..	I	..	..

542. Tending will consist in freeing the crowns of sandal trees and also of such of their hosts as may need it from creepers ; and in cutting down trees that are interfering with the free development of the sandal. While doing this, however, the fact must be borne in mind that during its sapling stage sandal needs some shade, more especially lateral shade, becoming more light-demanding as it gets older. Saplings must be helped, if they are being suppressed, by *cutting back* the growth that is interfering with them, but on no account must such growth be *uprooted* as it is quite possible that it may be serving as host to the sandal. This fact must also be remembered in freeing the crowns of the older trees, and no possible host must be destroyed. Ample overhead light should be given while lateral shade is maintained ; the ideal condition for sandal is that it should grow in what almost amounts to a chimney.

The Range Officer shall himself direct the first two days tending operations each year and shall inspect at least 10 per cent of the area of each compartment tended during each year and shall certify to the work. The District Forest Officer should inspect a fair proportion of the tended areas every year.

SECTION 8.—ARTIFICIAL REGENERATION.

543. *General.*—Sandal does not occur in the following reserves :—

Savanthagudde, Chinkramalai, Mujimalai, Panamberi, Vadanaberuhalla and Balkattehalla. They are not included in the Fuel Working Circle and parts of them are suitable for the introduction of sandal artificially either by raising ‘ propagation centres ’ or nuclei from which regeneration will subsequently spread naturally or by sowing sandal in prepared strips. Portions of Andar reserve lying to the north of Chinkramalai reserve are found to be more suitable for such strip sowing of sandal than Chinkramalai reserve as the growth is of a better type for sandal, larger homogeneous areas are available and the place is more accessible.

544. *Propagation centres.*—Annually six propagation centres shall be raised in each of the above six reserves by the beat-guard. For this purpose each reserve mentioned above shall be divided roughly into five compartments, and six propagation centres shall be selected in one compartment each year. In the sixth year further centres will be chosen in the first compartment, and so on. By this means the propagation centres will be widely distributed as quickly as possible.

545. *Choice of site.*—Propagation centres should preferably be selected in close proximity to a stream or water-course, as the soil is likely to be deeper and more fertile in such a locality, and the chances of distribution of seed by birds, which generally congregate on

stream banks, and by water during high floods, are greater. Areas chosen should contain vigorous healthy tree-growth to act as hosts for the sandal. Adequate shade for the protection of the sandal in its youth should exist ; tree-growth should neither be too open nor too dense. Overhead light and lateral shade, especially on the south and the west, are essential to sandal. Evergreen areas are not suitable.

546. The propagation centres shall be selected by the Range Officer.

547. *Treatment.*—In the middle of a group of trees, or to the north-east of one, a circular area ten feet in diameter should be cleared. The slash should be piled up and burnt on it towards the end of March. The soil and the ash should be well mixed up and stakes driven in at an approximate espacement of 3 feet by 3 feet. Small dumps of sandal seeds, not exceeding the size of a saucer, should be put in at each stake early in May, and covered with damp straw. These dumps should be watered twice a week till the preliminary showers of the south-west monsoon fall. Dhall, *Dodonaea viscosa*, or some other suitable shrub should be sown broadcast in the propagation centre when the monsoon bursts, to act as hosts for sandal during its infancy.

548. *Fencing.*—Each centre must be strongly fenced with wooden posts and thorns. The height of the fence should be 5 feet, and it should be maintained in good repair till the sandal seedlings get above the reach of cattle and deer. The fence while effectively keeping out browsers provides shade for the young sandal.

549. *Fire protection.*—Each propagation centre must be fire-traced to a width of 15 feet all round it.

550. *Tending.*—Germination may take up to six weeks ; oppressive growth should be kept constantly in check by the subordinate in charge ; the soil around each group of seedlings should be worked up when it becomes hard and caked, but great care must be taken not to injure the root connections between the sandal and its hosts.

551. *Seed collection.*—Generally sandal seeds freely every year in March and April. Should the first seeding be a failure, a second seeding takes place in the month of October. Probably in South Kanara seeds obtained in October are more fertile than those collected in April. As an experiment seeds collected in both the months should be sown and the results recorded. Seeds should be collected from healthy trees with well developed crowns.

552. *Location on map.*—Each propagation centre shall be roughly located on a map of the reserve to a scale of four inches to one mile. The District Forest Officer should inspect the propagation centres from time to time and issue necessary instructions to the subordinate in charge.

553. *Cost.*—The work involved in the formation of such nuclei is small, and it has been found in other districts that the local subordinates can carry it out without difficulty ; no extra expenditure is therefore involved in the formation of these propagation centres.

554. *Strip regeneration experiment.*—This experiment will consist in introducing sandal in cleared and burnt strips, together with suitable temporary hosts. The advantages of raising sandal in strips are three-fold—

(i) There will be no lack of established hosts for the sandal ;

(ii) the young sandal plants will be shaded from the sun ;

(iii) a natural mixture of species will be maintained so that the conditions under which sandal grows in nature will be reproduced as nearly as possible.

This experiment shall be tried during the first five years of the plan ; further continuance of this method will be decided by the Conservator on the results achieved during the first five years.

The following prescriptions shall be carried out :—

Regeneration area.—Annually five acres, square or rectangular in shape, shall be taken up for regeneration in Andar and Balkattehalla reserves. In the first year an area of about 25 acres in each of the above two reserves shall be selected by the District Forest Officer personally and the first year's regeneration area marked by him. In subsequent years further areas contiguous to the first area shall be taken up.

The site chosen should contain enough tree-growth to serve as hosts for sandal, and should support moderately deep loamy soil. Hard laterite soils should be avoided but soft laterite is not actually deterrent to sandal. Situations with evergreen ground flora are unsuitable.

Width, direction and lay-out of strips.—The strips should be wide enough to ensure that the sandal plants are not crowded too close to the host trees. The width of the strip is a function of the average height of the surrounding jungle and the period for which it is proposed to expose the seedlings to the direct rays of the sun every day. It can be shown

that if the average height of the jungle is 10 feet and it is intended to expose the strip to the sun for four hours (10 a.m. to 2 p.m.), the theoretical width of the strip should be 6 feet. In this case, each plant would receive the direct rays of the sun for two hours.

The strips shall be not less than 6 feet nor more than 9 feet in width, and shall be spaced at more or less regular intervals of about 20 yards. There should thus be one strip per chain.

The strips shall be cut straight and shall run in the north-south direction, so as to be constantly at right angles (more or less) to the movement of the sun.

Cutting and burning.—All growth (except sandal) in the strips shall be cut to ground level in early April. The slash shall be billetted if necessary and left to dry in the strip for a month. In the middle of May, the dry slash shall be burnt carefully *in situ.*

Soil preparation.—The ash left after the burning shall be raked well into the soil. Stakes will be placed in the middle of the strips, throughout their length, at intervals of four feet.

Sowing.—Immediately after a good shower in May, ten selected sandal seeds shall be dibbled in a small circle round each stake. The seed patches shall be mulched with straw or grass.

At the stake itself and in a concentric circle of a radius of one foot around the sandal seeds, seeds of one or more of the following shrubs shall be dibbled. Similarly, the burnt portion of the entire strip shall be sown up with one or more of these species :—

Cassia tora, Cassia glauca, Cassia siamea, Dodonaea viscosa, Scutia indica, Acacia farnesiana, Cajanus indicus (dhall).

Protection against game.—The cutting of strip lines is usually a direct invitation to animals to walk along them. It is therefore proposed to block easy movement along the strips by piling up thorny slash across the strips at regular intervals of ten yards. It is believed that the absence of grass on the burnt strips and the bushy growth of the temporary hosts will serve to protect the sandal seedlings against game and cattle till they grow out of their reach. *Dodonaea viscosa* is recommended as a good nurse for sandal, not only because there are indications that it confers partial immunity to spike on the sandal but also because no animal is attracted to its foliage.

Fencing of the area is therefore not prescribed, but if experience shows it to be necessary some form of tight lock fencing will have to be used.

Tending.—Such tending as is necessary shall be carried out under the orders of the District Forest Officer. Casualties shall be replaced during the monsoon by excess seedlings from other stakes.

SECTION 9.—SUPPLEMENTARY REGULATIONS.

555. Todar and Hosabettu reserves will continue to be treated under the Forest Village System.

These reserves together with Nire, Vorwady, Mavinaguli and Kassankatte reserves will be closed against the exercise of the general concessions allowed in the forests of South Kanara District.

The result of excessive opening of the canopy by cutting leaves of unclassified species under the special concessions of South Kanara has affected the growth of sandal to such an extent that the closure of the above reserves to the exercise of the concessions is considered imperative.

The above reserves as well as all strip regeneration experimental areas shall be specially fire-protected by clearing and burning the boundaries of the reserves and the plots to a width of 20 feet.

SECTION 10.—CONTROL.

556. The following control records shall be maintained :—

The Control Book.

The Record of Works.

The Strip Regeneration Ledger and the Control Maps.

Sample entries of the Control Book, the Record of Works and the Strip Regeneration Ledger are given in Appendix II. The Control Map shall be maintained only for the reserves wherein propagation centres are prescribed. This map shall be to a scale of four inches to one mile for each reserve, and on it the approximate location and the serial number of each propagation centre shall be sown.

A plan of each strip regeneration area on a scale of 16 inches to one mile shall be filed with the Strip Regeneration Ledger. This plan will show diagramatically the lay-out of the strips and the position of sandal survivals at the beginning of the second and the third monsoons.

CHAPTER IX.—WORKING PLAN FOR THE MINOR PRODUCE WORKING CIRCLE.

SECTION 1.—GENERAL CONSTITUTION.

557. This working circle comprises the entire area of reserved forests of the division and all unreserves and lands at the disposal of Government. In ' kumaki' lands the kumakidars enjoy the privilege of collecting minor forest produce provided such collection is for *bona fide* domestic requirements. The above privilege can in no way be alienated except with the land to which it is attached. The kumakidars cannot sell or profit by the disposal of the produce on the ' kumakis '. The minor produce in the ' kumaki ' lands can be disposed of by the kumakidar, when he does not consume it himself, only to the lessee within the area leased to the latter. The lessee and the kumakidar can come to a mutual agreement regarding the disposal of the produce in kumakis of the kinds specified in the lease of the area, but the kumakidar cannot dispose of such produce to any other person except the lessee without the latter's consent.

SECTION 2.—METHOD OF SALE.

558. The entire area of the working circle is divided into forty-two convenient farms which are annually leased out in public auction by the Revenue Department and this system shall be continued. The sales are subject to confirmation by the District Forest Officer who may close down any reserve or part of it to the collection of the produce, and may enter into separate leases for specific produce not included in the list of produce published at the time of auction. The lease will be for one year from 1st July to 30th June. The following products are included in the minor produce lease :—

Cardamoms, Shigekay, Soap-nut, Wild Nutmeg, Wild mace, Cashew nuts, Honne fruits, Pepper, Cinnamom flowers (except Theja and Kadwa species which are leased out separately), Surgi flowers, Silk cotton, Bones (but not elephant tusks), Honey, Wax, Black dammar, Wild plantains, Gums and resins from natural exudation, Myrabolams, Nux Vomica. The right to collect canes (except the Naga variety which does not occur in the Division), rattans, reeds, creepers and fibres, Kiragarabeelu, matting grass in river beds and Kadushige bark, is sold only in reserved forests. Contractors are prohibited from removing the rhizome or any part of the root system of canes. Canes must be cleanly cut above the ground level.

Cinnamom.—Separate leases are granted for the collection of leaves and buds of Theja and Kadwa species of Cinnamom from the unreserves and Government lands of the division. The local practice is to distil the oil in crude earthen pots.

Cashew nuts (*Anacardium occidentale*).—Large quantities of these nuts are annually exported to America from Mangalore and while the present slump in trade has affected every other produce, it has but slightly affected the price of Cashew nuts. This produce is mostly obtained from private sources and the contribution of reserves is little except what is obtained during minor produce collection from trees on unreserves. Prescriptions have been made under the Fuel Working Circle, that *Anacardium occidentale* shall be planted in poor laterite soils of fuel coupes where other tree-growth is scanty as it gives a fair quality fuel. Should this procedure also improve the value of minor produce leases, the management should endeavour to raise the species on a larger scale, in poorly wooded areas, especially in the coastal reserves. It can be easily raised by direct sowing or planting and needs little subsequent tending. Trees begin to yield from about the fifth year of planting.

SECTION 3.—CONTROL.

559. The Control form to be maintained with sample entries, is given in Appendix II.

CHAPTER X.—WORKING PLAN FOR THE GRAZING WORKING CIRCLE.

560. As extensive forest-clothed unreserves and numerous private forest properties afford very considerable facilities for grazing, there is but small demand for it within the reserved forests of this division.

561. The total area of reserved forests available for grazing after deducting areas under regeneration and such of those reserves as are specially closed to grazing, is approximately 250,000 acres. The average number of cattle allowed to graze in the reserves in the past is 13,700. The grazing incidence would thus appear to be 18 acres per cow unit but actually it is reckoned, by the district, to be only 10 acres per cow unit, inasmuch as a large part of the 250,000 acres referred to above is inaccessible or for one reason or another is not used for grazing. Anyway the grazing incidence is light.

562. All the forests covered by this plan, with the exception of those that are specially closed under the various working circles, will be open to grazing for the following animals at the rates noted against each :—

	RS. A. P.	
Buffaloes	0 10 0	each.
Cows	0 6 0	each.

Burnt areas are to be closed to grazing immediately and for not less than one year—see also paragraph 576.

CHAPTER XI.—MISCELLANEOUS PRESCRIPTIONS.

SECTION 1.—ADMINISTRATIVE CHANGES.

563. Owing to the proposal contained in the South Mangalore Working Plan to abolish Beltangady Range in South Mangalore Division, the following reserves will be transferred to the North Mangalore Division from the date of sanction of this working plan :—

	ACS.
Charmady-Kannapady reserve (Part)	8,866
Naravi reserve (Part)	28,411

The above two reserves will form part of the Mangalore Range. The revised boundary between the North and South Mangalore Divisions will be the main ghat road from the top of Charmady ghats up to Punjalkatte then the eastern and the southern boundaries of Mangalore taluk. For purposes of administrative convenience Mundaje-Kap reserve will however be retained under the control of the District Forest Officer, South Mangalore.

SECTION 2.—ROADS AND COMMUNICATIONS.

564. All existing forest roads and cart-tracks shall be maintained in good repair. Roads not specifically utilizable for the exploitation of forest produce during the currency of this working plan will require to be maintained only to such an extent as will ensure their remaining in good condition. For this purpose sufficient drainage to carry away surplus water during the monsoon must be provided by annually clearing the side drains of obstructions and in certain cases, by cutting cross drains across the road surface. Inspection paths, and foot or bridle paths which would be useful for purposes of inspection, shall be cleared annually to a width of 10 feet only. The total length of existing forest roads in the division is 60 miles and the cost of maintenance will be Rs. 1,200. The cost of maintenance of 13 miles of new roads proposed under this plan will be Rs. 390 per annum. A sum of Rs. 1,600 per annum for the annual maintenance of roads and paths in the division is therefore provided in the financial forecast to this plan. Discretion should be exercised in utilizing the funds allotted in the order of importance of the roads. Repair works shall be done as liberally as funds will permit with due regard to the condition of each road.

565. The following cart-tracks shall be constructed during the year specified against each, to serve the extraction of timber from the coupes proposed for working during the period of this plan. The proposed roads are indicated roughly in the detailed maps accompanying this plan. No actual alignment of roads was done by the working plans staff except in the case of the proposed road in Andar reserve for which a rough alignment was made ; it is indicated on the ground by wooden stakes. Judging from the nature of the country the other proposed roads will offer no difficulty in alignment or construction.

In view of the above facts no accurate estimate of costs can be made, but an approximate figure has been arrived at based on the average cost of construction in the past in similar localities of the division, and modified where necessary by personal knowledge of the country.

566. (*a*) A cart-track 12 feet wide shall be constructed from Hadiangady to Narasabial in Andar reserve to serve as an export road for the timber proposed for extraction from Felling Series IV. The estimated distance is about 3 miles and an approximate forecast

of the cost of construction will be Rs. 3,600. This road shall be constructed in 1932, or if fellings in unreserves are taken on hand, the construction of this road can be deferred till this felling series is taken on hand for extraction. In the same year the existing rough cart-track from Ajekar to Hadiangady shall be reconditioned and the alignment improved upon where necessary to connect the new construction mentioned above with the main Someshwar-Karkala road near Ajekar. The length of this road is about 6 miles and the estimated cost is roughly Rs. 750.

567. (*b*) Construction of a cart-track 12 feet wide from the main Jadkal-Kolluru road into the Megany Valley reserve over a distance of about 3 miles to tap coupes I to X of Felling Series I of the Timber Working Circle. The estimated cost of this road is about Rs. 900. This road shall be constructed in 1932. It will be necessary to construct the road to coupe I at first and the balance can be extended as the coupes are progressively worked.

568. (*c*) Reconditioning and improving the existing cart-track from Jadkal to Basraberu enclosure and beyond it to serve as an export road for the timber proposed for extraction from Felling Series II of the Timber Working Circle. The approximate length of the road is 6 miles and a rough estimate of cost is Rs. 1,200. This road will not be needed until timber extraction is actually taken up in this series which largely depends on the revival of market conditions.

569. (*d*) Construction of a cart-track from the Wandse-Kolluru road to the Clear Felling Working Circle over a distance of 2 miles. The estimated cost is Rs. 600. The existing cart-track to Mavinkar enclosure can be utilized for the extraction of timber from the first two coupes. The actual construction of the proposed road may be deferred to 1934.

570. (*e*) Feeder roads will be required in almost all the timber felling series in order to reduce dragging to the very minimum necessary. These shall be carefully aligned and laid out on the most economic lines. Possibilities of extending the feeder roads into later adjoining coupes must not be lost sight of at the time of the first alignment. The following is a rough estimate of the length of feeder roads or drag paths necessary in each felling series of the Timber Working Circle :—

Felling Series I	10 miles.
Felling Series II	5 miles.
Felling Series III	8 miles.
Felling Series IV	6 miles.
Total	29 or 30 miles.

These feeder roads should not cost more than Rs. 100 per mile, making an estimated total of Rs. 3,000.

SECTION 3.—BUILDINGS.

571. Existing buildings shall be maintained in good repair. The annual repairs to buildings shall include clearing rank vegetation round the buildings to a distance of 100 feet. No new buildings are proposed for construction during the period of the plan. A sum of Rs. 1,200 per annum is provided in the financial forecast towards the maintenance of existing buildings. Details for this figure are given below ; they are of necessity approximate, and are based on past actuals as far as possible :—

	Cost of maintenance per annum.
	RS.
Repairs to District Forest Officer's quarters at Mangalore	300
Repairs to 4 Range offices at Rs. 30 each	120
Repairs to 4 Range quarters at Rs. 30 each	120
Repairs to 9 Foresters' quarters at Rs. 12 each	108
Repairs to 21 Forest guards' quarters at Rs. 8 each	168
Repairs to 6 double-room Forest guards' quarters at Rs. 12 each.	72
Repairs to 3 Inspection sheds at Rs. 20 each	60
Repairs to Rest-house at Wandse	40
Repairs to 2 Rest-houses, one at Alur and another at Kadike at Rs. 20 each	40
Other miscellaneous sheds and improvements, etc.	155
Total	1,183 or 1,200

SECTION 4.—WELLS.

572. Existing wells should be cleaned once a year and their surroundings kept clear of vegetation. Drainage should be provided to prevent surface water from discharging into the wells. No new construction is proposed. There are twenty-six wells in the division and a sum of Rs. 200 per annum is provided in the financial forecast towards their maintenance.

SECTION 5.—FIRE-PROTECTION.

573. Reference has already been made in Part I, Chapter V to the vulnerability of the coastal and foot-hills reserves of the division to annual fires and the impracticability of ensuring immunity from them within reasonable cost. Long, winding reserve boundaries in the division, coupled with the danger resulting to forest property from the annual burning of kumaki lands by private owners, complicates protection measures. Efforts will therefore be largely confined to the protection of the more important reserves and the most vulnerable parts of reserves in the division.

574. Given protection from fire over a series of years the tendency of South Kanara forests is to revert to an evergreen association which gives a large measure of natural immunity from fires. Further protection in such cases would become unnecessary as an evergreen ground flora would prevent to a large extent chance ignition.

575. Particularly in the coastal and foot-hill portions of the division there are certain reserves which are very susceptible to annual fires, and year after year the area burnt down increases and the forest crop deteriorates in quality and the forest floor gets impoverished of its humus. In cases where entire protection of such reserves is impracticable or so expensive as to be prohibitive, endeavours are to be made to isolate those parts of the reserves that are most frequently and severely burnt and afford protection to them so as to prevent further extension of such areas of degraded forest. For this purpose the maintenance of fire control maps is of great importance.

576. Much may be done to prevent fires and to enlist the co-operation of the people if burnt areas are immediately closed to grazing, to allow of recuperation and it is prescribed that this be done and for such periods as circumstances may direct in each case—See also paragraph 562.

577. Subject to financial limitations the measures prescribed below shall be carried out, in the order of importance given. Where fire-tracing is prescribed, the mode of procedure will be to cut guide lines 5 feet wide and to burn the intervening strip ; but where the trace runs along an exterior boundary only one guide line on the interior side will be necessary. Where the forest abuts on to a perennial stream, no trace will be burnt.

The following measures are prescribed :—

I. Areas under regeneration.

578. (*a*) Plantations under shelterwood shall receive further protection for ten years. Their perimeters will be fire-traced on all vulnerable sides to a width of 20 feet on exterior lines and for 10 feet where they adjoin a similar plantation. Fire patrols will be appointed during the dry season in Jatkatmale and Someshwar.

(*b*) All coupes under regeneration including those which have been formed since 1925 will be separately fire-traced to a width of 20 feet where they adjoin natural forest and for 10 feet where they adjoin other coupes. Fire patrols will be appointed during the dry season in Madibare, Doddinamane and Andar.

(*c*) Fuel coupes will be fire-traced around the full periphery of the reserve (except where they are bounded by streams). The boundary of each annual coupe, as also the margins of any extraction road which may be in actual use, will be scraped and burnt in the year following felling to a width of 10 feet, but not subsequently. Special watching establishment during the dry season shall be appointed for Felling Series I and II, III and IV, V and VI and VII.

(*d*) All coupes progressively regenerated under the Clear-felling Working Circle shall be fire-traced to a width of 20 feet where the coupe adjoins natural forest and to a width of 10 feet where they adjoin a similar plantation. The fire patrol for Madibare reserve can patrol these coupes also.

(*e*) All existing plantations of *Acacia Sundra* and those formed under this working plan shall be fire-traced to a width of 20 feet along the periphery of the coupe. Internal coupe lines shall be fire-traced to a width of 10 feet only. The fire patrols provided for the fuel felling series under (*c*) above, can patrol these plantations also.

(*f*) All sandal propagation centres shall be fire-traced to a width of 15 feet by the beat guard.

II. Exterior and interior boundaries.

579. (*a*) Road margins shall be fire-traced on both sides to a width of 15 feet except in the following instances :—

(1) Where the road passes through a cutting at least 10 feet deep ;

(2) Where the forest descends into a nullah or stream running parallel to and only a short distance from the road ;

(3) Where the character of the vegetation bordering the road is distinctly evergreen or sub-evergreen for a distance of at least one furlong into the forest and holds no evergreen trees of value.

(*b*) All rights-of-way, frequented footpaths, bridle-tracks, but not inspection paths unless they are used by coolies, shall be fire-traced to a width of 15 feet. Exception may be made if such paths lead through heavy evergreen undergrowth, and there are no evidences of fire having occurred in the vicinity for a number of years.

III. Areas particularly vulnerable to fires.

580. The first essential is the correct posting and maintenance of fire control records and maps. During inspections, Range officers should satisfy themselves that all fire-occurrences are reported by beat subordinates.

Reserves adjoining pattas or kumakis which are apt to suffer yearly from fire will be inspected by the Range Officer and the circumstances reported to the District Forest Officer. Measures will be taken to protect such reserves by fire-tracing exterior boundaries to a width of 20 feet and interior cart-tracks and footpaths to a width of 15 feet.

The following reserves require special protection of the above nature :—

Kassankatte, Harkur, Honnakodlu, Darlegudde, Mudaregudde, Mavinaguly, Balkattehola, Dottinaberu, Bakudihola, Mettukallugudde, Baregundy (southern boundary), Chinkramale, Nire, Vorwady, Andar and Someshwar lower boundary, Durgamalai, Jarvattukadu, Mavinakodlu, Hurabe, Nananjimale, Kodialmale, Kodyamale, Todar, Hosabettu, Mujimalai, Panamberi and Naravi (lower boundary).

IV. Ghat areas.

581. Grassy patches on the ghat tracts, especially those adjoining footpaths which lead to the Mysore boundary, shall be early-burnt by cutting a guide line 5 feet wide along the periphery of the patch in October-November and burning the patch early in January.

582. The district boundary shall be cleared to the full width of 10 feet on the Kanara side along those portions ordered by the District Forest Officer in each year. So far as known, escapes from above ghats into Kanara are rare, and will be minimized by early-burning of grassy slopes used for grazing purposes.

583. The total length of the reserve boundaries in the division is 1,225 miles. Of this about 550 miles are actually fire-traced, but the figure probably includes some interior traces also. The cost of fire-protection in the past works out to about Rs. 4 per mile of fire-trace, but has recently been reduced to Rs. 3 per mile. It is thought that under the above prescriptions the total length of fire-trace will not be far short of 550 miles. The following is an approximate forecast of the fire-protection operations in the division :—

	RS.
Fire-tracing 550 miles at Rs. 4 per mile (owing to the proposed increase in the width of the fire lines under this plan a higher rate of Rs. 4 is provided for fire-tracing)	2,200
Watching establishment :—Seven fire patrols for about four months in the year at Rs. 9 each...	252
Early burning grassy areas ; lump sum	48
Total ..	2,500

Fire control maps shall be maintained for all areas under special protection. Emphasis is laid on the importance of maintaining fire maps efficiently and accurately. The District Forest Officer should pay personal attention to this matter and should always have the fire maps available in camp when he is inspecting.

SECTION 6.—BOUNDARIES.

584. Boundary lines are allowed to be overgrown in some of the more remote reserves of the division. It is prescribed that such lines should be cleared annually and the cairns maintained in good repair. The total length of the artificially maintained boundary

lines of the division is 1,225 miles ; of these approximately 30 per cent, i.e., 370 miles will be cleared under the fire protection estimates. About half will be cleared by the beat subordinates every year. The maintenance of the balance, i.e., one-sixth of the total, will have to be provided for under sanctioned estimates as forest guards cannot be reasonably expected to clear lengthy boundaries in remote and inaccessible localities every year ; as examples of such localities may be cited the Baregundi, Nagankalbare and Mudugalbare reserves on the ghat slopes. Provision is therefore made in the financial forecast for the annual clearance of about 200 miles of reserve boundary lines at Rs. 3 per mile. The actual allocation of boundaries to be cleared annually is left to the District Forest Officer.

585. The registers containing Section 16 Notifications of the reserves of the division are not, in some instances, posted up to date. Differences were noticed in respect of Ballimane, Tombattu, Bakudihola reserves ; these should be reconciled by the District Forest Officer.

SECTION 7.—LIVESTOCK.

586. There are three elephants in the division for dragging work. An analysis of the past working shows that on an average each elephant works on 180 days in a year and the average daily haul of timber is 90 c.ft. The total haul for one year for all the three elephants should therefore be $90 \times 3 \times 180 = 48,600$ c.ft. which is slightly in excess of the quantity proposed for extraction during the period of the plan. The present establishment of elephants is therefore sufficient.

SECTION 8.—CONCESSIONS.

587. Reference has already been made in paragraph 45 to the abuse of concessions in the coastal reserves especially in Sarpanamane, Baindur, Kadike, Guruvanacote, Karnigudde, Kursegudde, Herur, Honokodlu, Darlegudde, etc.

588. The exercise of the concessions is unsound in principle and incompatible with the maintenance, apart from the improvement, of the forests. In spite of the extensive waste lands, unreserves and privately owned forest-clad lands of the division, special free concessions, which do not exist in any other district of the Presidency, have been granted to the local populace. The exercise of these privileges is without doubt harmful to the forests and destructive of property which the Government holds on behalf of the public. With the more widely distributed fuel felling series, as provided for in this plan, the requirements of the ryots for manure leaf and dead fuel, can be met to a large extent from the annual coupes, by permitting the villagers to cut trees and branches of unclassified species below specified dimensions in the year prior to felling of the coupe (vide paragraph 475). The policy of the management should be to extinguish by gradual stages the existing concessions. After repeated requests the Government have in their order No. 2765-1/32-1, dated 5th December 1932 agreed to this principle and have ordered that to start with from 1933–34, the following six reserves namely, (1) Guruvanacote, (2) Karnigudde, (3) Kussegudde, (4) Harkur, (5) Chittoor and (6) Mudaregudde should be closed to the concessions as well as the six sandal reserves enumerated in paragraph 555 above.

SECTION 9.—ILLICIT FELLINGS.

589. Illicit fellings continue on a large scale in some of the coastal reserves. Villagers cut green stems and branches of classified species and remove them after they are dry under the cloak of the special concessions, which permit of the removal of dry fuel from reserves. In view of the wide distribution of fuel felling series, referred to above, the ryots should find little difficulty in obtaining their requirements of fuel from the annual coupes on payment of a small fee to the fuel contractor ; the existence of extensive forest-clad unreserves afford immense facilities to the villagers for obtaining their fuel requirements. It is recommended that the existing privilege of collecting dead fuel from reserves be withdrawn. This question should be taken up separately by the District Forest Officer.

SECTION 10.—BAMBOO SALES.

590. Owing to the recent flowering of bamboos over the entire division and the immaturity of the present crop no bamboo extraction is prescribed under this plan. Should there be a demand for dead bamboos, the District Forest Officer may sell them.

SECTION 11.—RESEARCH AND COLLECTION OF STATISTICS.

591. *Sample plots.*—Three sample plots of *Hopea parviflora* in Pillarkan reserve are maintained by the Provincial Silviculturist to study the rate of growth of *Hopea parviflora*. Quinquennial measurements are recorded in the office of the Provincial Silviculturist.

Three sample plots of *Acacia sundra* in Baindur reserve are maintained by the Provincial Silviculturist to record the girth increment of *Acacia sundra* trees. Measurements are recorded once in five years.

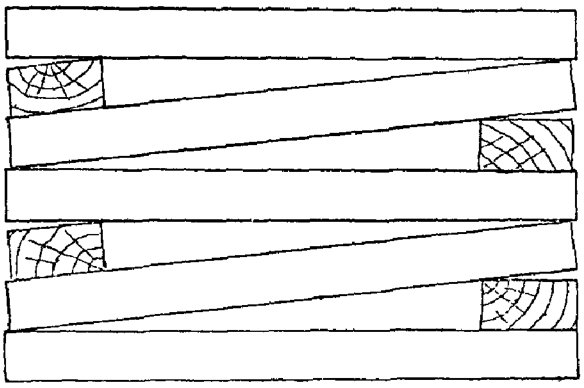
592. A start has been made in the preparation of volume tables (vide paragraphs 283 and 284). The data collected are inadequate. It is therefore prescribed that the breast-height girths and the volume of timber obtained after conversion, of all timber trees felled in the division every year, shall be communicated to the Provincial Silviculturist after classification into one-foot girth classes.

SECTION 12.—EXPLOITATION AND UTILIZATION.

593. As far as possible conversion of logs into sleepers at stump site should be encouraged. On the steep slopes of Andar reserve, Felling Series IV, dragging by elephants may not be feasible. Hand transport of sleepers is recommended.

It is advisable, further, that as much timber as possible should be sold standing to contractors, who will undertake the extraction, conversion and marketting. This may not be possible at present but it is a goal towards which the efforts of the management should be directed.

594. Reference has already been made in paragraph 340 to the necessity for the proper seasoning of sleepers. There should be ample space all round each sleeper to allow free circulation of air. A diagram showing the correct method of stacking is given below.



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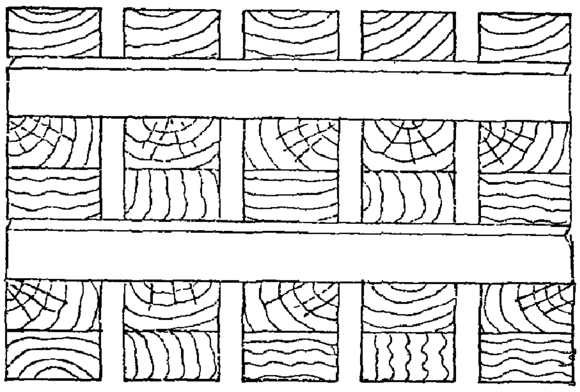

END

CHAPTER XII.—ESTABLISHMENT AND LABOUR.

595. No changes in the existing establishment are proposed beyond that consequent on the transfer of part of Naravi and Charmady-Kannapady reserves from South to North Mangalore Division which will entail the transfer also of the existing establishment of one Forest Guard.

596. Labour shortage exists during the harvesting seasons. Sometimes difficulty is experienced in importing labour to the Someshwar and Andar forests. It is probable coolies will demand extra rates for working in this locality. Temporary accommodation will have to be provided for housing the sawyers and coolies employed for work on sleeper operations in Andar. In other localities ample labour is available to carry out the works prescribed under this plan. The Kudubies living in Mavinkar enclosure would suffice for carrying out the departmental operations prescribed for the Clear-felling Working Circle.

CHAPTER XIII.—FINANCIAL FORECAST AND COST OF THE WORKING PLAN.

SECTION 1.—FINANCIAL FORECAST.

597. Any forecast of the future prices of timber and its cost of production can at any time be only approximate ; this fact is further complicated now by the present economic depression in general and the slump in the timber trade in particular.

598. The following estimate of revenue is a conservative one, making little allowance for appreciation in the value of timber, fuel and other commodities when trade conditions revive. In the majority of cases, the prices obtained during the recent sales have been used though they are the lowest ever fetched for timber since the formation of the division. Similarly a conservative rate of Rs. 3 for every exploitable *Acacia sundra* tree is provided for in the revenue statement although the maximum a tree fetched in the recent past has been Rs. 5–8–0.

599. Consequent on the reduction in the general cost of living, the management has been temporarily able to reduce the wages of coolies and therefore the cost of production of forest produce ; but in the forecast of expenditure the reduced rates have not been taken into account as it is apprehended by the writer that the present reductions are likely to be temporary. Therefore the expenditure statement is inclined to be on the liberal side. Recent actuals have been largely utilized in forecasting expenditure under heads for which no detailed specifications are available, such as contingencies, travelling allowances, etc.

600. With regard to the cost of establishment the estimates are made on the basis of the average figures ordered to be adopted by the Conservator, III Circle, in his reference No. A. 265/31, dated 26th March 1931. Hitherto the division has generally been managed by an officer of the Provincial Forest Service ; therefore, although an officer of the Imperial Service, on a salary of Rs. 625 per mensem, has been in charge since 1930, the expenditure statement provides only for a Provincial Service Officer.

601. The Conservator of Forests, VI Circle, normally tours in the South Kanara district only once a year when he inspects both the South and North Mangalore Divisions. There are four other divisions under this Conservator's charge, and therefore, estimating the cost of direction, one-fifth of the Conservator's pay and of the cost of his establishment has been charged to the whole of South Kanara. This amount is equally apportioned between the North and South Mangalore Divisions.

602. The financial forecast appended below reveals an annual surplus of Rs. 25,500. The gross revenue per acre will be Re. 0–6–9. The cost of management per acre will be Re. 0–5–3. The surplus per acre will be Re. 0–1–6. The percentage of expenditure to gross revenue will be 78. This figure is a high one, as the protective establishment employed constitutes a heavy burden on the division. Considering the large number and scattered nature of the reserves to be protected, and the fact that protection is of paramount importance in South Kanara where conservation of water-supply is essential, the protective establishment employed is the absolute minimum necessary.

603. *Revenue.*—

	RS.
1 Clear-felling Experimental Working Circle—	
By sale of timber in the log (vide paragraph 377)—	
Lagerstrœmia lanceolata 31,400 c.ft. at 10 annas per c.ft.	19,630
Terminalia paniculata 8,100 c.ft. at 8 annas per c.ft.	4,050
2 Timber Working Circle—	
By sale of timber in the log (vide paragraph 329).	
Lagerstrœmia lanceolata 117,700 c.ft. at 10 annas per c.ft.	73,560
Terminalia paniculata 133,800 c.ft. at 8 annas per c.ft.	66,900
Terminalia tomentosa 9,000 c.ft. at 10 annas per c.ft.	5,620
Dalbergia latifolia 170 c.ft. at Re. 1–4–0 per c.ft.	210
By conversion of Hopea and *Xylia* into sleepers—	
15,000 c.ft. of *Xylia* (vide paragraph 329) converted into 20 per cent B.G. sleepers—920 at Rs. 7–12–0 per sleeper	7,130
40 per cent M.G. sleepers—4,000 at Rs. 3–2–0 per sleeper	12,500
10 per cent scantlings—1,500 c.ft. at Rs. 1–2–0 per c.ft.	1,690
79,500 c.ft. of Hopea (vide paragraph 329) converted into 40 per cent B.G. sleepers—9,780 at Rs. 7–12–0 per sleeper	75,800
15 per cent M.G. sleepers—7,950 at Rs. 3–2–0 per sleeper	24,840
15 per cent scantlings—11,925 c.ft. at Rs. 1–4–0 per c.ft.	14,910
3 Fuel Working Circle—	
By sale of fuel coupes (vide paragraph 466 for areas and paragraph 120 for rates)—	
Kadike Felling Series—720 acres at Rs. 40 an acre	28,800
Baindur Felling Series—609 acres at Rs. 20 an acre	12,180
Golihole Felling Series—860 acres at Rs. 20 an acre	17,200
Herur Felling Series—526 acres at Rs. 15 an acre	7,890
Alur Felling Series—569 acres at Rs. 50 an acre	28,450
Wandse Felling Series—775 acres at Rs. 40 an acre	31,000
Ampar Felling Series—499 acres at Rs. 30 an acre	14,970
Kodyamale Felling Series—208 acres at Rs. 15 an acre.	3,120
4 Sandal Working Circle—	
By sale of 33 tons (vide paragraph 540) of cleaned sandal-wood at Rs. 1,500 (vide paragraph 123) per ton	49,500
5 Cutch Working Circle—	
By sale of 91,070 *Acacia sundra* trees (vide paragraph 503) at Rs. 3 per tree (vide paragraph 121). Provision is made for the total number of exploitable trees available in the working circle	2,73,210

	RS.
6 Minor Produce Working Circle—	
By lease of minor forest produce farms both in the reserves and the unreserves at Rs. 2,880 based on the average of the past since the division was formed (vide paragraph 122)	28,800
7 Grazing Working Circle—	
By sale of grazing permits to graze cattle in the reserves at Rs. 5,070 per annum based on the average of the last fifteen years (vide paragraph 277) plus an approximate allowance of Rs. 500 per annum for the reserves newly transferred to this division—Total Rs. 5,570 per annum	55,700
8 Miscellaneous—	
(*a*) Compounding fees, rent on buildings, water leases, shooting licences, import duty on fuel taken to important towns, etc., at Rs. 9,860 per annum based on the average of the past 15 years (vide paragraph 277)	98,600
(*b*) Timber on unreserves consisting of tree value on revenue lands assigned on dharkast based on the actuals of the last five years at Rs. 8,930 per annum	89,300
(*c*) Revenue realized by assessing the value of fuel on Government lands assigned on dharkast at Rs. 7,300 per annum based on the average of the past five years	73,000
Total revenue for the ten-year period ..	**11,18,560**
Average annual revenue ..	**1,11,860**

604. *Expenditure.*—

1 Clear-felling Experimental Working Circle—	
Felling, dragging and transport of timber to sale depots—39,500 c.ft. of timber in the round at Re. 0–6–9 per c.ft. (vide paragraph 107 for cost of production)	16,660
Clear-felling 200 acres to be done by kumridars	..
Burning the area of 200 acres ; to be done by kumridars	..
Aligning, staking, preparation of patches, inspection paths, fire protection, etc.—200 acres at Rs. 6 per acre	1,200
Nursery charges, first year—Lump sum	500
Nursery charges, second year to tenth year at Rs. 300 per annum	2,700
Sowing and planting, third weeding and soil working in the first year (first two weedings will be done by kumridars) at Rs. 7 per acre for 200 acres ..	1,400
Replacing casualties and tending in the following two years, 200 acres at Rs. 4 per acre	800
2 Timber Working Circle—	
Felling, dragging and transport of timber in the log to sale depots, 260,670 c.ft. at Re. 0–6–9 per c.ft (vide paragraph 107 for cost of production) ..	1,09,970
Cost of production and delivery of Hopea and Xylia sleepers at Mangalore (vide paragraph 110)—	
10,700 B.G. sleepers at Rs. 4–4–0 per sleeper	45,480
11,950 M.G. sleepers at Rs. 2–2 0 per sleeper	25,390
13,425 c.ft. of scantlings at Re. 0–13–0 per c.ft. (vide paragraph 111) ..	10,910
Regeneration of 4,500 gaps distributed over 2,362 acres including tending in the subsequent years at Rs. 1–8–0 per gap	6,750
3 Plantation Working Circle—	
Tending 3,800 acres of plantations under shelter-wood at Rs. 0–8–0 per acre (vide paragraph 445)	1,900
4 Fuel Working Circle—	
Tending and cleaning coppice shoots, regeneration in blanks, climber cutting, etc., over 4,766 acres (vide paragraph 466) at Rs. 4 per acre	19,060
5 Sandal Working Circle—	
Extraction, cleaning and transport of 33 tons of sandal to Mangalore at Rs. 70 per ton	2,310
Tending sandal in reserves on a three-year felling cycle 9,564 (vide paragraph 541) at Re. 0–2–0 per acre	1,200
Cost of strip regeneration experiments in two localities at Rs. 15 per plot per annum for five years (vide paragraph 554)	150
6 Cutch Working Circle—	
Regenerating 25 acres with *Acacia sundra* at an espacement of 12 feet × 12 feet at Rs. 15 per acre (vide paragraph 507)	380

		RS.	RS.
7	Proposed capital construction—		
	Buildings and wells	..	
	Roads—		
	A road to timber felling series IV (vide paragraph 566) ..	4,350	
	A road to timber felling series I (vide paragraph 567) ..	900	
	A road to timber felling series II (vide paragraph 568) ..	1,200	
	A road to Clear-felling Working Circle (vide paragraph 569).	600	
	Construction of 30 miles of feeder roads (vide paragraph 570).	3,000	
	Total ..	**10,050**	
	Interest at 5 per cent per annum for 10 years on half the above capital as a large part of the work will not be undertaken till the latter half of the working plan period		2,510
8	Annual maintenance—		
	Buildings at Rs. 1,200 per annum (vide paragraph 571)		12,000
	Roads at Rs. 1,600 per annum (vide paragraph 564)		16,000
	Wells at Rs. 200 per annum (vide paragraph 572)		2,000
9	Maintenance of Livestock—Provided for in the cost of production of timber.		..
10	Survey and demarcation—		
	Maintenance of reserve boundaries at Rs. 600 a year (vide paragraph 584) ..		6,000
11	Fire protection at Rs. 2,500 per annum (vide paragraph 583)		25,000
12	Establishment—		
	(*a*) Pay of district establishment at Rs. 950 per mensem for 10 years ..		1,14,000
	(*b*) Range establishment—		

	RS.	
Coondapoor Range	786	per mensem.
Shankaranarayana Range	482	,,
Udipi Range	694	,,
Mangalore Range	440	,,
Extra guard for the reserved forest transferred from the South Mangalore Division	17	,,
	2,419	,,

or Rs. 29,028 per annum for 10 years	2,90,280
(*c*) Allowances—	
Travelling allowance, fixed travelling allowance, conveyance allowance based on the average of the past at Rs. 8,000 per annum for 10 years ..	80,000
(*d*) Contingencies based on the average of the past at Rs. 2,500 per annum for 10 years	25,000
(*e*) Direction—	
Taking one-fifth of the total cost of the Conservator and his establishment and dividing it equally between the North and South Mangalore Divisions—4,400 per annum	44,000
Total expenditure for the period..	**8,63,550**
Total annual expenditure ..	**86,360**
Annual surplus of revenue over expenditure	**1,11,860** **— 86,360**
	25,500

605. SECTION 2—COST OF THE WORKING PLAN.

Budget head.	Amount.		
52-A. (*f*) Regeneration—			
	RS.	A.	P.
Pay of officers non-voted	9,509	4	0
Pay of officers voted	9,147	6	0
Pay of establishment voted—			
Permanent	2,460	1	0
Temporary	454	6	0
Travelling allowances non-voted	622	6	0
Travelling allowances voted	2,958	14	0
Fixed travelling allowance	280	6	0
Other compensatory allowances	123	2	0
Contingencies	58	3	0
Works	492	2	0
Total ..	**26,106**	**2**	**0**

NOTE.—(1) Pay of officers non-voted includes overseas pay.
(2) The cost of the working plan works out to As. 1–7 per acre on the entire division.

C. C. WILSON,
Conservator of Forests, III (Working Plans) Circle, Ootacamund.

P. W. DAVIS,
Working Plans Officer, Mangalore.

M. H. KRISHNASWAMY,
Assistant Working Plans Officer, Mangalore.

Summary of Prescriptions.

CHAPTER I.—BASIS OF PROPOSALS.

Summarized Prescriptions.

	PARA.	PAGE
1 Methods of treatment—		
A 'Selection' or 'Group-selection' method, Clear-felling method with artificial regeneration, the Simple Coppice method and Improvement Fellings are prescribed	289	61
2 Working circles—		
Nine working circles have been constituted :—		
(*a*) The Timber Working Circle ; area 7,681 acres	290	61
(*b*) The Clear-felling Experimental Working Circle ; area 200 acres ..	291	62
(*c*) The Plantation Working Circle ; area 3,793 acres	292	62
(*d*) The Fuel Working Circle ; area 19,139 acres	293	62
(*e*) The Protection Working Circle ; area 224,305 acres	294	62
(*f*) The Cutch Working Circle ; area 13,982 acres	295	62
(*g*) The Sandal Working Circle ; area 175,026 acres	296	62
(*h*) The Minor Produce Working Circle	297	62
(*i*) The Grazing Working Circle	298	62
3 Period of the plan—		
The period covered by this working plan is ten years from 1st April 1932 to 31st March 1942	299	62

CHAPTER II.—TIMBER WORKING CIRCLE.

	PARA.	PAGE
1 Objects—		
To supply the timber requirements of Coondapoor and Hangarkatte markets, and sleepers to the railways	300	62
To regenerate the gaps created by the removal of exploitable trees ..	300	62
To restrict disturbance to tree canopy	300	62
2 Limits—		
The total timber-bearing area of the division is roughly 60,000 acres ..	301	62
Limits of the working circle delimited to ten coupes to be felled during the period of the plan and past felled coupes	301	62
3 Crop—		
The crop is mostly of a deciduous character with an occasional admixture of semi-evergreen. *Lagerstrœmia lanceolata* and *Terminalia paniculata* are well represented. Natural regeneration of useful species scanty in Series I and II. *Xylia* root-suckers are moderately present in Felling Series III. *Hopea parviflora* regeneration in Felling Series IV is satisfactory	302	63
4 Felling Series—		
Four series have been formed ; two in Coondapoor Range of which one (i.e.) Series II, is a 'Reserve Series'; one in Udipi and one in Shankaranarayana Range. Brief description of the crop in each felling series is given	303–308	63–64
5 Division of the area—		
Compartments were formed for purposes of preliminary description and are shown by Arabic numbers on the map. Ten coupes in each felling series are indicated on the detailed maps	309	64
6 Analysis and valuation—		
Most of the timber-bearing reserves were stock-mapped to types by divisional staff. Some were done by the working plan staff. In some cases the detailed analysis by the district did not agree with the ideas of the working plan staff, but the divisional stock maps were adopted	310	64
101·6 acres were enumerated in one foot girth classes by the working plan party in Felling Series I, and 8·85 acres in Felling Series II (this being a 'reserve felling series,' further detailed enumerations were not done)	311–312	64–65
Enumerations were done by divisional staff over 490 acres in Felling Series III of all utilizable species of and over $4\frac{1}{2}'$ girth at breast-height. Results shown in	313	65
In Felling Series IV, 316 acres of the area enumerated by the 'logging party' are included, and the enumerations have been adopted ..	314	65
In addition cent per cent enumeration of Hopea over 155 acres outside the enumerated area was done by the working plan staff	315	66

Summarized Prescriptions.

	PARA.	PAGE
7 Silvicultural system—		
Owing to irregular nature of the crop and inadequate knowledge of regeneration operations in the division, no silvicultural system based on periodic blocks is feasible. The system proposed consists of the removal of mature trees supplemented by artificial regeneration of the gaps so created, so that the forest is not further depleted. By the end of the next ten years, with the experience gained in the methods of regeneration, it should be possible to prescribe some regular system of management	316, 317	66–67
8 Rotation—		
Rate of growth is a trifle less than in South Mangalore, but, tentatively, the rotation adopted therein, viz., 90 years, is adopted here also ..	318	67
9 Felling cycle—		
A tentative felling cycle of 30 years is adopted	319	67
10 Exploitable size—		
Hopea and other evergreen species 6′ and above at breast-height ; *Xylia xylocarpa* 4½′ and above at breast-height ; other deciduous species 6′ and above at breast-height	320	67
Reasons for raising girth limits above those hitherto in force :—		
(1) Restriction in the disturbance of tree canopy	321	67
(2) Supply of high grade logs to the market so as to command a better sale value	322	67
(3) Deciduous species given protection from fire keep sound up to 6′ and more in girth	323	67
11 Coupes—		
Ten coupes have been formed in each felling unit. Average size of annual coupe is :—		
Felling Series I .. 66; Do. II .. 65; Do. III .. 63; Do. IV .. 47	324	67
12 Possibility—		
Total timber-bearing area is 60,000 acres. Enumerated areas contain 9 trees of saleable species per acre. Entire timber areas of the division may be taken to contain at least 6 trees of utilizable species per acre. Each tree when felled may yield 30 c.ft. of merchantable timber. So an average acre will yield 180 c.ft. during the rotation of 90 years. Annual increment per acre is 2 c.ft. or, for the entire forest, 120,000 c.ft.	325–326	67–68
13 Yield—		
Regulated by area with a volume guide. Less than the possibility ..	327, 328	68
Statements of yield given	329	69
In working out the yield from areas surveyed and enumerated by the logging engineering branch, a tree with a diameter of 16″ at mid-bole length is taken to correspond to 6′ girth at breast height	329	70
14 Marking—		
(1) Restrict to trees that can be sold at a profit		
(2) Canopy not to be unduly opened..		
(3) Of two exploitable trees within 30 feet of each other only one shall be marked		
(4) Exploitable trees standing over advance growth, or regeneration of useful species, shall be marked		
(5) Do not widen gaps of an evergreen character		
(6) Timber species not ordinarily extracted may be marked to ‘ create ’ a market, at District Forest Officer's discretion		
(7) Dead and wind-blown trees should be marked if saleable	331	70
Complete marking by end of February preceding the year of felling. Marking shall be done by a Ranger and subsequently inspected by District Forest Officer	333	70
Serially number marked trees ; enter approximate bole length and girth at breast-height in Form 3	334	70
15 Felling—		
Felling shall be completed by August	335	71
Square 10 per cent of the logs as an experimental measure ; if remunerative extend the operation	336	71
When a tree is felled, measure length of merchantable bole and mid-girth and record under the entries already made in Form 3	337	71

Summarized Prescriptions.

	PARA.	PAGE
16 Dragging—		
Dragging to be completed by end of December. Conserve elephant power by suitably arranged feeder tracks	338	71
17 Sawing—		
Sleeper species shall be sawn into sleepers	339	71
18 Stacking—		
Allow free and equal circulation of air. Sawn material shall not be in direct contact with the ground	340	71
19 Carting—		
Timber from Felling Series I and II to be carted to Wandse, from Felling Series III to Sowda and Felling Series IV to Gurpur	341	71
20 Boating—		
From Felling Series I, II and III to be boated to Coondapoor and from Felling Series IV to Mangalore	342	71
21 Tabular statement of fellings—		
Given in	343	71–72
22 Regeneration general—		
Our knowledge of regenerating under shelterwood is limited. Gaps created by felling to be regenerated with deciduous species or evergreen species depending on the suitability of the locality	344	73
23 Selection of gaps—		
On completion of felling, District Forest Officer to make an inspection of coupe. Select suitable gaps for treatment and indicate on a map 16 inches to 1 mile. Notes regarding size of gap, undergrowth and middle storey to be made	346	73
24 Treatment—		
Gaps in dry deciduous to be regenerated with deciduous species and evergreen gaps with shade bearing species	348	73
25 Nursery—		
Permanent nursery provided under Clear-felling Working Circle will suffice for Felling Series I and II. New permanent nursery to be constructed for Felling Series III. New permanent nursery to be constructed under broken shade for Felling Series IV..	349	73
26 Gaps in deciduous forest—		
Size.—Minimum 24′ diameter. Enlarge small gaps if necessary by cutting inferior species all round	350	73
Clearing.—Collect slash and spread evenly over gaps in December ..	351	74
Fire-protection.—Entire coupe to be fire-traced before burning the gaps	352	74
Burning.—In April, obtain an even burn	353	74
Staking.—Roughly $4\frac{1}{2}' \times 4\frac{1}{2}'$	354	74
Soil loosening.—To be done near stakes, 9″ to 12″ depth and $1\frac{1}{2}'$ diameter.	354	74
Sowing and planting.—Insert 1-year old teak stumps in the middle of the gap. Dibble *Dalbergia latifolia* at other stakes. If soil unsuited to teak, sow seeds of deciduous species in May. Consult Provincial Silviculturist periodically	355	74
Experimental.—Treat half a dozen gaps as prescribed for deciduous forest	356	74
27 Gaps in evergreen forest—		
Size.—No larger than that actually created by the removal of the tree.	357	74
Clearing.—Cut under growth ; leave low shade	358	74
Staking.—Approximately $4\frac{1}{2}' \times 4\frac{1}{2}'$	359	74
Soil loosening.—Patches over a diameter of $1\frac{1}{2}'$ and a depth of 9″ shall be prepared near the stakes	359	74
Sowing and planting.—In the middle of the gap put in 2-year old *Artocarpus hirsuta* stumps. At other stakes sow Hopea in June ..	360	74
28 Tending—		
Weeding and climber-cutting and soil working prescribed during the year of formation and two years subsequent to it	361–363	74–75
29 Climber-cutting—		
Climber-cutting shall be done at the time of marking	364	75
30 Coupe lines—		
Clear to a width of 12′ and maintain for a period of three years only ..	365	75
31 Fire protection—		
Rigid protection of all the ten coupes proposed for felling during the working plan period	366	75

	PARA.	PAGE
32 Grazing—		
Closure of regenerated coupes for a period of seven years from the year of regeneration	367	75
33 Concessions—		
Special concessions shall not be allowed for a period of five years from the year of regeneration	368	75
34 Regeneration of Hopea—		
Tending natural regeneration of Hopea in felled coupes prescribed and programme given	369	75–77
35 Control—		
Maintenance of Control Book, Regeneration Ledger, Control Journal and Control Map prescribed	370	77

CHAPTER III.—THE CLEAR-FELLING EXPERIMENTAL WORKING CIRCLE.

	PARA.	PAGE
1 Object—		
To experiment with the artificial regeneration of deciduous species in clear-felled areas	371	77
2 Area and division—		
Limited to 200 acres only ; divided into ten annual coupes of 20 acres each to be regenerated during the period of the plan. Further areas to be allotted at the time of revision if results are satisfactory ..	371	77
3 Crop—		
Essentially of a deciduous type with a transitional ground flora. Parts contain timber of utilizable species, *Lagerstrœmia lanceolata* and *Terminalia paniculata* and parts contain no timber, being mostly result of past 'kumri.' Height growth of principal trees is about 60 feet	372	77
4 Blocks and compartments—		
Each regeneration area will be numbered serially from 1 to 10. No compartments have been formed	373	77
5 Analysis and valuation—		
Enumerations conducted over 12·64 acres of timbered areas show the average outturn per acre of exploitable species to be approximately 270 cubic feet	374	78
6 Silvicultural system—		
Clear-felling with artificial regeneration	375	78
7 Exploitable size—		
Anything which can be marketed at a profit can be exploited	376	78
8 Yield—		
The yield is regulated by area with an approximate volume guide ..	377	78
9 Kumri cultivation—		
If there is a demand for 'kumri,' i.e., raising field crops in combination with plantations, the annual coupes will be divided into 2-acre blocks and one block given to each family headman	378	78
10 Demarcation of coupes—		
Coupes to be demarcated by a cut line 6 feet wide, all round	379	78
11 Marking for timber felling—		
The District Forest Officer to communicate to the Range Officer as to the species and girth limits above which trees are to be marked for extraction. Timber felling to be completed by August	380, 381	78–79
12 Clear-felling—		
Clear-felling to be completed by the end of December either by kumridars, free of charge, or departmentally	382	79
13 Fire-protection—		
Fire-line 20 feet wide to be cut all round the coupe in January	383	79
14 Burning the area—		
Burning of slash to be completed early in March. Second burning may be necessary. Burning to be done either by kumridars free or departmentally. Good uniform burn important	384	79
15 Statement of fellings and subsidiary operations—		
Given in section 6	385	79
16 Seed collection—		
Teak seeds can be obtained from South Mangalore, Wynaad or Nilambur divisions ; other species can be collected within the division ..	386—391	79–80

	PARA.	PAGE
17 Nursery—		
A permanent nursery 120 feet × 150 feet providing 60 beds of 40 feet × 4 feet with possibilities of supplying 32,000 stumps annually is provided. Nursery to be fenced	392, 393	80
Seed beds to be sown in the second week of May and covered with straw and small bamboo splits. Watering to be done by subordinates, if and when necessary	396, 397	80
When the seedlings have developed 2 to 3 pairs of leaves prick out at 6″ × 6″ to develop thick carrot-like root for stumping..	398	81
In Travancore, seedlings are not transplanted but are grown thick in the nursery and stumped. This method should also be tried	399	81
18 Planting plan—		
The District Forest Officer to inspect before clear-felling, and indicate on a plan, 16 inches to 1 mile, the areas proposed for regeneration with each species and under each method	403	81
19 Preparation of the area—		
Two inspection paths 6 feet wide each to be provided. Aligning and staking to be done in accordance with instructions on pages 40 to 43 of Madras Forest Pocket Book	404, 405	81
20 Espacement—		
6 feet × 6 feet	405	81
21 Preparation of patches—		
Soil at each stake, to a depth of 12 inches, and over a diameter of 1½ feet, to be loosened..	406	81
22 Species—		
Teak, *Terminalia tomentosa, Dalbergia latifolia, Pterocarpus marsupium, Albizzia lebbek, Artocarpus hirsuta*	408—412	82
23 Distribution—		
Roughly 75 per cent of the annual coupe with teak. 15 per cent with *Dalbergia latifolia* and *Pterocarpus marsupium*, and 10 per cent with other species	413	82
(i) *Teak.*		
24 Methods of formation—		
Direct sowing.—Limited to one acre in each annual coupe ; 10 to 12 selected seeds to be dibbled in the second week of April	415	82
Notching germinating seed direct. Put out a dump in March. Seeds will germinate when the monsoon bursts. Make two or three small holes in each patch and put one germinating seed in each. Not more than one acre to be tried under this method	416	82
Planting seedlings.—Six weeks old nursery seedlings shall be put out in the month of June, after the monsoon has broken at each prepared patch. Care to be taken at the time of planting not to injure root system. Not more than one acre to be tried under this method ..	417	82
Stump planting.—One-year old stumps (1) from transplant beds direct and (2) from seed beds on the Travancore method, shall be stumped, leaving about 1½″ of stem and about 9″ of root, and inserted into the prepared patches in May. Planting by the two methods to be kept separate and results observed	418, 419	82–83
Instructions regarding stump planting.—Collum level with ground. Depth of hole equal to length of root. Close in interspaces firmly. Plant firmly. The greater part of the area to be regenerated by stumping ..	418, 419	82–83
(ii) *Dalbergia latifolia.*		
Direct sowing recommended. Planting 1-year old stumps also to be tried. The Mount Stuart method of sowing *Dalbergia latifolia* and *Pterocarpus marsupium* at the corners of patches in areas planted with teak should be tried for five years. If results are successful, it shall be continued	421, 422	83
(iii) *Pterocarpus marsupium.*		
Direct sowing in prepared patches. Try transplanting 6-week old nursery seedlings	422	83
(iv) *Terminalia tomentosa.*		
Don't mix with teak	423	83
(v) *Artocpus hirsuta.*		
Direct sowing and planting 2-year old stumps	424	83

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(vi) *Albizzia lebbek.*		
Direct sowing and planting 1-year old stumps	425	83
25 Weeding—		
Three weedings in the first year. All clear weedings. First two weedings to be done by kumridars consisting of hand forking 2 feet all round the plants and pulling out weeds. Third weeding combined with soil working with hand forks in lines to be done departmentally in December ..	426—434	83–84
Second and third years two weedings each and soil working round slow plants	435	84
26 Replacement of casualties—		
Casualties are to be replaced only in the first and second years. In sown areas replace casualties with germinating seeds in the first year and stumps in the second year. In planted areas replace with stumps ..	436	84
27 Mixture—		
Natural regrowth of deciduous species to be fostered to form a suitable mixture with teak	437	84
28 Cleaning—		
Free valuable species from fast growing inferior species and cut creepers and climbers, in the fourth year of formation. Bamboo regrowth should be cut down to the ground in these operations and kept down ..	438	84
29 Thinning—		
No thinnings will be necessary during the period of this plan	439	84
30 Fire-protection—		
Special protection from fire of all regeneration areas is prescribed during the period of the plan. External lines 20 feet wide and internal 10 feet	440	84
31 Grazing—		
Close regeneration areas to grazing during the period of the plan ..	441	84
32 Concessions—		
Complete closure of the plantations to special concessions during the period of the plan is prescribed	442	84
33 Control—		
Control Book, Regeneration Ledger, Nursery Ledger, Control Journal and Control Map	444	85
CHAPTER IV.—THE PLANTATION WORKING CIRCLE.		
1 Area—		
The area of this working circle is 3,793 acres. It includes all regular plantations of *Hopea parviflora* and other evergreen species in Udipi Range but not areas regenerated in the Someshwar timber coupes	445	85
2 Crop—		
The overwood contains trees of deciduous species. Bamboo flowered in 1920 and its regeneration is found in more open localities. A well advanced middle storey of evergreen species is present. Undergrowth consists of evergreen species and Strobilanthes. Climbers are plentiful in places	446	85
The overwood rarely contains trees of exploitable dimensions	446	85
Various espacements have been adopted in the formation of the Hopea crop. The percentage of success is between 65 and 85. The average height of the seedlings is 5 to 6 feet. No further plantation work is contemplated under the plan	447	85–86
3 Division of the area—		
Plantations will be denoted by the reserve name and the year of formation.	448	86
4 Treatment—		
The plantations will be subjected to tending largely at the discretion of the District Forest Officer, with the object of stimulating the development of the young Hopea by removal of overhead cover. Definite rules for the guidance of the District Forest Officer are given	450—455	87–88
Judicious reduction of shade is urgently required, but undue interference with the top canopy is not advocated	451	87–88
Strobilanthes shall be cut below the collum of the ærial roots to a distance of 4 feet all round each plant. In such localities further reduction of shade should be done carefully	451	87–88
In places where *Leea* is abundant, opening up the canopy should be gradual.	451	87–88
In shallow laterite soils a loosening of the soil round each Hopea plant should be made	451	87–88
In stiff soils, forking round the plants should be done	451	87–88

	PARA.	PAGE
5 Tending—		
The main object will be to encourage height growth in the Hopea plants..	453	88
6 Thinning—		
Thinnings will not be necessary during the period of the plan	455	88
7 Statement of operations—		
A tabular statement of operations to be carried out is given	456	88–89
8 Control—		
Maintenance of a Plantation Ledger and Control Journal are prescribed.	457	89

CHAPTER V.—THE FUEL WORKING CIRCLE.

1 Constitution—		
Coastal reserves and inland reserves at a distance of 20 to 25 miles from the coast, susceptible of working on economic lines, are included. Total area of the working circle is 19,139 acres divided into eight felling series	458	90
2 Felling series—		
Reasons for enhancing number of felling series are— (1) to reduce the size of annual coupes and thus encourage competition among contractors, (2) to lessen the difficulties experienced by ryots in getting their requirements of leaf manure and dead fuel	459	90
3 Character of the vegetation—		
Description given for each felling series	460	90–91
4 Analysis and valuation—		
No enumeration was done	461	92
5 Silvicultural system—		
Simple coppice	462	92
6 Rotation—		
Forty years. The mean annual girth increment of coppice shoots in coupes felled in the past is ·60 of an inch. This is based on a series of measurements made by Mr. Habibulla Sahib. The rotation is fixed at forty years so as to produce the size required for the market, i.e., 24 inches in girth	463	92
7 Yield—		
Regulated by area. Approximate forecast of yield in chowks based on the results of past working is given	464	92
8 Fellings—		
One coupe in each series to be sold annually in public auction, to a contractor who will do the felling and coppicing in accordance with the terms of the agreement now in force	465	92–93
9 Statement of fellings and subsidiary operations—		
Given in detail	466	93–95
10 Regeneration—		
Coppice shoots and existing regeneration will be mainly relied upon. Artificial regeneration of blanks not less than half an acre each in extent shall be undertaken in the annual coupes	467, 468	95
11 Sowing—		
Sow *Hopea wightiana* seeds in evergreen localities. Sow seeds of deciduous species in dry localities after burning slash	469	95
12 Climber-cutting—		
Climber-cutting will be done in November following felling and another five years after felling	470	96
13 Weeding and cleaning—		
Weeding and cleaning to be done in November following felling	471	96
Another cleaning to be done if necessary in the third year	472	96
14 Grazing and concessions—		
Felled coupes to be closed for six years from the year of felling to grazing and special concessions	475	96
15 Fire-protection—		
Exterior lines 20 feet wide and interior lines 10 feet wide to be maintained.	476	96
16 Survey and demarcation—		
Survey and demarcation of annual coupes to be done in January preceding the year of felling. Lines to be cleared 12 feet wide	477	96

	PARA.	PAGE
17 Indicator areas— Two half-acre representative plots to be felled departmentally and out-turn recorded. The produce to be sold to contractor who shall pay the department Rs. 20 per acre for felling and stacking	478	96
18 Control— Control Book, Record of Works, Control Journal and Control Maps prescribed	479	96–97

CHAPTER VI.—THE PROTECTION WORKING CIRCLE.

	PARA.	PAGE
1 Constitution— All areas not allotted to any other working circle excepting the Minor Produce and Grazing Working Circles have been included in the Protection Working Circle	480	97
2 Valuation— No enumeration was done but the area was stock-mapped to show vegetational types	481	97
3 Treatment— No working is prescribed. The subordinates in charge to do climber-cutting as prescribed by the District Forest Officer	482–3	97

CHAPTER VII.—THE CUTCH WORKING CIRCLE.

	PARA.	PAGE
1 Constitution— This working circle comprises all the areas of the reserves and unreserves of Coondapoor Range which contain sufficient *Acacia sundra* growth to warrant their being included	484	97
2 Area— The area is 13,982 acres	484	97
3 Felling series— Four felling series A, B, C and D have been formed. Of these A and C are constituted out of the reserved forests and they shall be ' Reserve Felling Series ' to be opened for exploitation only when the yield from the other two series, B and D, which are constituted out of unreserves, is insufficient to meet the demand	485	97
Reasons for increasing the number of felling series from 2 to 4 are given	486	97
4 The crop— *Acacia sundra* forms the predominant species. Its chief associates are species belonging to dry scrub type. Occasionally sandal also occurs in mixture with *Acacia sundra*. The species rarely attains more than a girth of 3 feet at breast-height and 25 feet in total height, the average being 12 to 15 feet	488	98
5 Analysis— No enumerations were undertaken as the entire area was enumerated between the years 1922 and 1924 ; figures collected then have been adopted in the calculation of the yield and possibility	490	99
6 Silvicultural system— The ' selection system ' is adopted relying for regeneration on coppice regrowth and existing natural seedling regeneration	491	99
7 Exploitable size— Trees of and above 24 inches in girth over bark at breast-height will be considered exploitable	492	100
8 Rotation— The rotation is fixed at twenty-eight years	493	100
9 Felling cycle— The felling cycle will be seven years	494	100
10 Coupes— Each felling series is divided into seven annual coupes	495	100
11 Possibility— The possibility based on the present growing stock is 9,100 trees per annum	496	100
12 Yield— The annual yield is regulated by number of trees with an area check ..	497	100
The average annual yield prescribed for the period of this plan approximately equals the possibility of the forest	496	100

	PARA.	PAGE.
13 Exploitation—		
Rules for marking are given	499	101
Marked trees in each annual coupe will be advertised for sale every year ..	500	101
14 Departmental manufacture—		
Manufacture of cutch may be undertaken departmentally if a foreign market is secured and if the operations prove remunerative	502	101
15 Statement of fellings—		
A tabular statement showing the order in which fellings are to be done and the expected yield is given	503	102–103
16 Regeneration—		
Natural.—Existing natural seedling regeneration and reproduction by coppice, after felling, will be relied upon to regenerate the felled coupes	504	103
No tending is prescribed in unreserves. When the ‘ Reserve Series ’ are opened tending consisting of climber-cutting and thinning of coppice shoots wherever necessary shall be done in the third year after felling.	505	103
Artificial.—Annually five acres shall be artificially regenerated ; if the demand for cutch does not increase, further plantation work shall be stopped after five years	507	103
Seed collection.—It shall be done in February-March. Fresh mature pods should be collected, dried and carefully stored	508	103
The five acres to be regenerated annually shall be surveyed and demarcated by the Range Officer in the month of February	509	103
The *espacement* will be 12 feet × 12 feet	510	103
Aligning and staking shall be done in accordance with the instructions contained in the Madras Forest Pocket Book	511	103
Sowing shall be done in the first week of May ; about 80 to 100 seeds in each patch shall be sown	512	103
Fencing.—The entire regeneration area shall be substantially fenced with stout wooden posts and brushwood..	513	103
Nursery.—A permanent nursery consisting of 3 to 4 beds shall be maintained to produce seedlings for the replacement of casualties	514	104
17 Subsidiary silvicultural regulations—		
Weeding shall be done as often as necessary and as thoroughly as funds will permit	516	104
18 Replacement of casualties—		
Casualties will be replaced during the monsoon following formation with nursery seedlings	517	104
19 Removal of overwood—		
Removal of overwood may be necessary in the seventh year of formation but depends on the rate of growth..	518	104
20 Thinnings—		
No thinning will be required during the period of the plan..	519	104
21 Protection—		
All plantations shall be rigidly protected against fire and closed to the exercise of concessions	520, 521	104
Grazing shall not be allowed for five years from the year of formation ..	522	104
22 Control—		
The following control records shall be maintained :— the Control Book, the Record of Works, the Regeneration Register, the Control Journal, and the Control Map	523	104

CHAPTER VIII.—THE SANDAL WORKING CIRCLE.

	PARA.	PAGE.
1 Constitution—		
All sandal bearing areas in reserves and village lands of North Mangalore Division are included	524	104–105
2 Extent—		
The total area of the working circle is 175,026 acres inclusive of patta lands containing sandal	525	105
3 Felling series—		
Three felling series have been constituted— Series I consisting of areas in Mangalore Range. Series II consisting of areas in Udipi Range. Series III consisting of areas in Shankaranarayana and Coondapoor Ranges	526	105

	PARA.	PAGE
4 Analysis—		
No sandal enumeration or detailed stock-mapping was carried out. Sandal bearing areas in reserves were stock-mapped	529	106
5 Past policy—		
Past sandal policy is discussed	530–532	106–107
6 Legal position—		
Analysis is given	533	107
7 Future policy—		
Outline is given	534	107
8 Prescription—		
No living trees shall be extracted from reserves ; only dead trees and stumps shall be removed. In unreserves and kumakis, all living sandal of and over 10 inches in girth and all dead trees and stumps containing heartwood shall be removed. Agreements shall be executed for all patta sandal. All exploitable sandal trees on patta lands in respect of which agreements have been executed, shall be extracted. All sandal trees containing heartwood that it is profitable to extract on kumaki or unreserve or patta lands whether occurring in the coupes of the year or outside them proposed for assignment shall be extracted by the Forest department before the lands are assigned	535	108
9 Felling cycle—		
A felling cycle of six years is adopted	536	108
10 Coupes—		
Each felling series is divided into six annual coupes	537	108
11 Yield—		
The working will be regulated by area. An approximate annual yield, based on past working, has been estimated	538	108
12 Exploitation—		
Rules for exploitation are given	539	108–109
13 Silvicultural regulations—		
No tending in unreserves is prescribed	541	111
Sandal areas in fuel reserves included in the Fuel Working Circle shall be tended by beat guards once in three years	541	111
Reserves where sandal occurs in some profusion shall be systematically tended on a 3-year cycle	541	111
Rules for tending sandal are given	542	111
14 Artificial regeneration—		
Propagation centres.—Annually six propagation centres in each of the six reserves indicated shall be raised by the beat subordinates free of charge. Detailed instructions regarding the creation and the maintenance of propagation centres are given	544–553	111–112
15 Strip regeneration—		
Experiments in strip regeneration of sandal are prescribed	554	112–113
16 Supplementary regulations—		
Sandal reserves not included in Fuel Working Circle shall be closed to the exercise of special concessions	555	113
Fire protection of sandal reserves and strip regeneration plots is prescribed	555	113
17 Control—		
The maintenance of the Control Book, the Record of Works, the Strip Regeneration Ledger and Control Maps is prescribed	556	113–114

CHAPTER IX.—THE MINOR PRODUCE WORKING CIRCLE.

1 Constitution—		
This working circle comprises the entire area of the reserved forests, all unreserves and lands at the disposal of Government	557	114
2 Method of sale—		
The existing practice of annually leasing out in convenient sized farms shall be continued. The lease will be for one year from 1st July to 30th June.		
Separate leases are granted for the collection of cinnamon leaves.		
Introduction of *Anacardium occidentale* is prescribed under the Fuel Working Circle. Should the value of Minor Produce lease appreciate on this account larger areas should be planted with *Anacardium* ..	558	114
3 Control—		
A Record of Works is prescribed	559	114

	PARA.	PAGE
CHAPTER X.—THE GRAZING WORKING CIRCLE.		
All the forests covered by this plan except those specially closed to grazing under the various working circles shall be open to grazing on the payment of As. 10 for a buffalo and As. 6 for a cow-unit per annum. Burnt areas are to be closed to grazing	562	115
CHAPTER XI.—MISCELLANEOUS PRESCRIPTIONS.		
1 Administrative changes—		
One forest guard will be transferred to this division from the South Mangalore Division owing to the proposed transfer of part of Charmady-Kannapady and Naravi reserves. The revised divisional boundary is referred to	563	115
2 Roads—		
Existing roads and newly proposed roads shall be maintained in good repair. Total length of existing roads is 60 miles and proposed roads is 13 miles. A sum of Rs. 1,600 per annum for annual maintenance is provided for in the financial forecast	564	115
New constructions.—(*a*) A cart-track from Haliangady to Narasabail in Andar reserve shall be constructed. Estimated length is 3 miles and cost Rs. 3,600. Existing rough cart-track from Haliangady to Ajekar shall be reconditioned. Length is 6 miles and estimated cost Rs. 750.	566	115-116
(*b*) Construction of a cart-track to Timber Felling Series I. Estimated length is 3 miles and cost Rs. 900	567	116
(*c*) Improvement to cart-track from Jadkal to Basraberu. Length is 6 miles and estimated cost Rs. 1,200	568	116
(*d*) Construction of a cart-track to the Clear-felling Working Circle. Estimated length is 2 miles and cost Rs. 600	569	116
(*e*) Construction of 30 miles of feeder roads in timber coupes at Rs. 100 per mile	570	116
3 Buildings—		
No new construction is proposed. Existing buildings shall be maintained in good repair. A sum of Rs. 1,200 per annum is provided for in the financial forecast	571	116
4 Wells—		
A sum of Rs. 200 per annum is provided for the annual maintenance of wells in the division	572	117
5 Fire-protection—		
Burnt areas to be closed to grazing	576	117
Where fire-tracing is prescribed the mode of procedure will be to cut guide lines 5 feet wide and burn the intervening strip	577	117
Plantations under shelterwood and those formed after clear-felling, existing and proposed *Acacia sundra* plantations, all coupes under regeneration, all reserves included in the Fuel Working Circle and sandal propagation centres shall be fire-protected and special fire patrols appointed wherever indicated	578	117
Road margins shall be fire-traced to a width of 15 feet on either side. Exceptions to this are given	579	118
All rights of way and frequented footpaths shall be fire-traced	579	118
All reserves which are specially vulnerable to fires are to be fire-protected.	580	118
Grassy areas on the ghats will be early burnt	581	118
The Kanara-Mysore boundary shall be cleared to a width of 10 feet along portions ordered by the District Forest Officer	582	118
6 Boundaries—		
Annual clearing of reserve boundary lines and maintaining the cairns are prescribed	584	118-119
7 Livestock—		
The existing number of elephants in the division will suffice for dragging.	586	119
8 Concessions—		
Government have ordered that the concessions be withdrawn from certain reserves	588	119
9 Illicit removal—		
The withdrawal of the existing concession of allowing people to remove dead-fuel from the reserves is recommended	589	119
10 Bamboo sales—		
No regular bamboo working is prescribed	590	119

	PARA.	PAGE
11 Research and statistics—		
Existing sample plots will be maintained	591	119–120
Further collection of statistics for the preparation of volume tables is prescribed	592	120
12 Exploitation and utilization—		
Hand transport of sleepers in Andar reserve is recommended	593	120
Instructions regarding the correct method of stacking sleepers are given.	594	120

CHAPTER XII.—ESTABLISHMENT AND LABOUR.

	PARA.	PAGE
1 Establishment—		
No changes in the existing establishment are proposed beyond the transfer of one forest guard along with the reserves proposed to be tansferred to this division from South Mangalore	595	120
2 Labour—		
Existing labour will suffice. In difficult and remote localities, temporary sheds should be constructed for housing the coolies	596	120

CHAPTER XIII.—FINANCIAL FORECAST.

	PARA.	PAGE
The estimate of revenue is a conservative one making little allowance for future appreciation in the value of timber, while the estimate of expenditure is reasonably liberal	598, 599	120–121
The revenue surplus anticipated in the working plan is Rs. 25,500 per annum	602	121
The gross revenue is Rs. 1,11,860 and the expenditure Rs. 86,360 per annum	603, 604	121–123

APPENDIX I.

List of trees and shrubs common in South Kanara (North Mangalore Division).

	Kanarese name.	Botanical name.
1	Anavu or Anagalu	*Adina cordifolia.*
2	Andipunar or Andinar.	*Carallia integerrima.*
3	Anile	*Terminalia chebula.*
4	Baine mara	*Caryota urens.*
5	Banapu or Mathi	*Terminalia tomentosa.*
6	Benga or Nethruhonne.	*Pterocarpus marsupium.*
7	Bilinandi or Benteak.	*Lagerstrœmia lanceolata.*
8	Bilkambi	*Albizzia stipulata.*
9	Bite	*Dalbergia latifolia.*
10	Burugadamara	*Bombax Malabaricum.*
11	Chakatte	*Schleichera trijuga.*
12	Challa	*Lagerstrœmia flos reginæ.*
13	Chara	*Holigarna arnottiana.*
14	Daddal or Kaval	*Careya arborea.*
15	Dalchini	*Cinnamomum zeylanicum.*
16	Dadsal or Thadsal	*Grewia tiliæfolia.*
17	Dhupa	*Vateria indica.*
18	Durkalu or Irpe	*Buchanania latifolia.*
19	Gandubidru	*Dendrocalamus strictus.*
20	Godda	*Odina wodier.*
21	Gugguldhupa	*Ailanthus excelsa.*
22	Gurgi	*Strobilanthes* species.
23	Halberu	*Hemidesmus indicus.*
24	Haiga or Karmar	*Hopea wightiana.*
25	Halemara	*Alstonia scholaris.*
26	Hebbalasu	*Artocarpus hirsuta.*
27	Hennubidru	*Bambusa arundinacea.*
28	Hirekodsa or Maddarsa.	*Holarrhena antidysenterica.*
29	Holehonne	*Calophyllum wightianum.*
30	Holemathi	*Terminalia arjuna.*
31	Honagalu or Marwa	*Terminalia paniculata.*
32	Jala	*Shorea talura.*
33	Jambe	*Xylia xylocarpa.*
34	Kalbhagi	*Albizzia odoratissima.*
35	Kalgarige	*Soymida febrifuga.*
36	Kakke	*Cassia fistula.*
37	Karimara	*Diospyros ebenum.*
38	Katchu	*Acacia sundra.*
39	Kanagalu	*Dillenia pentagyna.*
40	Kasanmara	*Strychnos nux-vomica.*
41	Kenjige	*Cæsalpinia* species.
42	Kiralbhogi	*Hopea parviflora.*
43	Massai	*Litsœa wightiana.*
44	Mavu	*Mangifera indica.*
45	Muthaga or Palasha.	*Butea frondosa.*
46	Myrole or Thornukki.	*Vitex altissima.*
47	Nagasampige	*Mesua ferrea.*
48	Narkolu	*Helicteres isora.*
49	Neerulli	*Stereospermum chelonoides.*
50	Nemar	*Memecylon edule.*
51	Neralu	*Eugenia jambolana.*
52	Ramapathri	*Myristica attenuata.*
53	Sagvani	*Tectona grandis.*
54	Salle	*Aporosa lindleyana.*
55	Soorati	*Hydnocarpus alpina.*
56	Thari or Shanthi	*Terminalia belerica.*

	Botanical name.	Kanarese name.
1	*Acacia sundra*	Katchu.
2	*Adina cordifolia*	Anavu or Anagalu.
3	*Ailanthus excelsa*	Gugguldhupa.
4	*Albizzia stipulata*	Bilkambi.
5	*Albizzia odoratissima.*	Kalbhagi.
6	*Alstonia scholaris*	Halemara.
7	*Aporosa lindleyana*	Salle or Sarale.
8	*Artocarpus hirsuta*	Hebbalasu.
9	*Bambusa arundinacea.*	Hennubidru.
10	*Bombax malabaricum.*	Burugadamara.
11	*Buchanania latifolia*	Durkalu or Irpe.
12	*Butea frondosa*	Muthaga or Palasha.
13	*Cæsalpinia* species	Kenjige.
14	*Calophyllum wightianum.*	Holehonne.
15	*Carallia integerrima*	Andinar or Andipunar.
16	*Careya arborea.*	Daddal or Kaval.
17	*Caryota urens*	Bainemara.
18	*Cassia fistula*	Kakke.
19	*Cinnamomum zeylanicum.*	Dalchini.
20	*Dalbergia latifolia*	Biti.
21	*Dendrocalamus strictus.*	Gandubidru.
22	*Dillenia pentagyna*	Kanagalu.
23	*Diospyros ebenum*	Karimara.
24	*Eugenia jambolana*	Neralu.
25	*Grewia tiliæfolia*	Dadsal or Thadsal.
26	*Helicteres isora*	Narkolu
27	*Hemidesmus indicus*	Halberu.
28	*Holarrhena antidysenterica.*	Hirekodsa or Maddarsa.
29	*Hopea parviflora*	Kiralbhogi.
30	*Hopea wightiana*	Haiga or Karmar.
31	*Holigarna arnottiana*	Chara.
32	*Hydnocarpus alpina*	Soorati.
33	*Lagerstrœmia flos reginæ.*	Challa.
34	*Lagerstrœmia lanceolata.*	Bilinandi or Benteak.
35	*Litsaea wightiana*	Massai or Mashe.
36	*Mangifera indica*	Mavu.
37	*Memecylon edule*	Nemar.
38	*Mesua ferrea*	Nagasampige.
39	*Myristica attenuata*	Ramapathri.
40	*Odina wodier*	Godda.
41	*Pterocarpus marsupium.*	Benga or Nethruhonne.
42	*Schleichera trijuga*	Chakatte.
43	*Shorea talura*	Jala.
44	*Soymida febrifuga*	Kalgarige.
45	*Stereospermum chelonoides.*	Neerulli.
46	*Strobilanthes* species	Gurgi.
47	*Strychnos nux-vomica.*	Kasanmara.
48	*Tectona grandis*	Sagvani.
49	*Terminalia arjuna*	Holemathi.
50	*Terminalia belerica*	Tari or Shanthi.
51	*Terminalia chebula*	Anile.
52	*Terminalia paniculata.*	Honagalu or Marva.
53	*Terminalia tomentosa.*	Banapu or Mathi.
54	*Vateria indica*	Dhupa.
55	*Vitex altissima*	Myrole or Thornukki.
56	*Xylia xylocarpa*	Jambe.

APPENDIX II.

Control forms.

CONTROL BOOK.

Timber Working Circle.

Prescriptions of the working plan.					Operations carried out.										
		Locality.					Locality exploited.			Details of yield obtained.					
													Sawn produce.		
Year of felling.	Nature of felling.	Reserve.	Coupe number.	Area in acres.	Year of felling.	Nature of felling.	Reserve.	Coupe number.	Area in acres.	Species.	Number of trees felled.	Yield of logs in cubic feet.	Kind.	Volume in cubic feet.	Percentage of yield.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
							Felling Series IV.								
1937–38.	Selection ..	Andar ..	II	45	1937–38.	Selection.	Andar ..	II	47	Hopea parviflora.	210	5,000	B.G. sleepers, 300 ..	975	20
													M.G. sleepers, 1,330.	2,000	40
													Scantlings	750	15

N.M.—18-A

Year of regeneration—1938-39.
Number of gaps regenerated—(Evergreen 200).
(Deciduous 50).
Average size of gap—(Evergreen 20′ × 20′).
(Deciduous 30′ × 30′).

Average number of patches per gap—30.
Species introduced—Hopea parviflora.
Artocarpus hirsuta.
Lagerstrœmia lanceolata.

REGENERATION LEDGER.

Timber Working Circle.

Felling Series IV.

Coupe No. II—Area, 42 acres.

Subordinate staff in special charge—Forester Achutan.

Wages of coolies—As. 6 for a male coolie, and As. 4 for a female or boy.

Analysis of cost 193 —193 *account.*

Month.	Cutting slash, billeting and heaping.	Burning the heaps.	Staking and preparation of the ground.	Cost of seed.	Sowing at stake.	Stump-planting.	Cost of nursery.	Replacement of casualties.	Weeding and soil working.	Fire-protection.	Other expenditure with details.	Monthly totals.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.			RS. A. P.	
Evergreen.													
November 1938	40 0 0	..	..	..	..	..	..	..	..	..	..	40 0 0	
March 1939	..	16 0 0	..	..	..	..	..	..	..	..	..	16 0 0	
April 1939	..	..	40 0 0	8 0 0	5 0 0	..	..	..	..	..	..	53 0 0	
May 1939	..	..	..	..	..	16 0 0	5 0 0	..	..	..	..	21 0 0	
July 1939	..	..	..	..	..	..	..	8 0 0	16 0 0	..	..	24 0 0	
October 1939	..	..	..	..	..	..	..	..	10 0 0	..	..	10 0 0	
Total ..	40 0 0	16 0 0	40 0 0	8 0 0	5 0 0	16 0 0	5 0 0	8 0 0	26 0 0	..	..	164 0 0	
Cost per acre ..													
Deciduous.													
Total ..													
Cost per acre ..													

	Evergreen. RS. A. P.	Deciduous. RS. A. P.
Cost during the year, 1938-39		
Average cost per acre		
Average cost per gap		
Total cost at the end of the year including previous expenditure		
Average total cost per acre		
Average total cost per gap		

Number of gaps successfully stocked with established regeneration—240.

CONTROL BOOK.

Clear-felling (Experimental) Working Circle.

Reserve—Megani Valley.

Prescriptions of working plan: Year of felling.	Coupe number.	Area in acres.	Nature of felling.	Operations carried out: Year of felling.	Coupe number.	Area in acres.	Nature of felling.	Species and form of produce.	Number of trees felled.	Number of logs or units of other produce.	Volume in cubic feet.	Remarks.
1935–36 ..	IV	20	Clear-felling.	1935–36.	IV	19	Clear-felling.	Lagerstrœmia lanceolata.	86	110	4,500	On actual survey and plotting, the coupe was found to be only 19 acres. Trees of utilizable species of and above 4 feet girth at breast-height were converted.
								Terminalia. paniculata	40	51	1,200	
								Total ..	**126**	**161**	**5,700**	

REGENERATION LEDGER.

Clear-felling (Experimental) Working Circle.

Reserve	Megani Valley.
Coupe number	IV.
Area in acres	19.
Short description of the area before felling (soil, aspect, drainage, vegetation, overwood and ground-flora).	Moderately deep, well-drained red loamy soil. Aspect, north-easterly. Predominant species. Terminalia paniculata and Lagerstrœmia lanceolata. Ground-flora is of varied composition ; in places it is of a transitional type ; in others dry deciduous.
Area regenerated under each species introduced.	ACS. Teak .. 14·0 Rosewood .. 2·0 Pterocarpus marsupium .. 1·2 Artocarpus hirsuta .. 1·0 Miscellaneous species .. 0·8
Espacement	6 feet × 6 feet.
Method of regeneration	Teak—Stump-planting, sowing and planting seedlings. Rosewood—Direct sowing in prepared patches and stump planting. Artocarpus hirsuta—Planting two-year old stumps. Pterocarpus marsupium—Direct sowing.
Dates of sowing or planting of each species.	Teak—Planting, 14th May 1936. Sowing, 12th April 1936. Rosewood—Sowing, 11th April 1936. Planting, 14th May 1936. Artocarpus hirsuta—Planting, 11th June 1936. Pterocarpus marsupium and miscellaneous species—Sowing, 13th April 1936.
Other remarks.	
Special difficulties encountered (pests, climbers, drought, etc.).	Although favourable weather prevailed for four days after planting, there was a continuous break in the monsoon for 27 days with the result some seedlings died of drought.

Year of plantation	1936–1937.
Date of timber felling	November 1935.
Date of clear-felling	December 1935.
Date of burning	February 1936.
Dates of second and third burnings	March 1936.
Agency of timber felling and extraction	Departmental.
Agency of clearing and burning	Kumridars.
Agency of sowing and planting	Departmental.
If kumried, date of handing back to the department	November 1936.
Area allotted to each kumridar	2 acres.
Subordinate establishment in special charge	Forester Ramappa, Forest guard Krishnan.
Rate of daily wages	As. 6 for a man coolie. As. 4 for a boy or female.
Other necessary information	....
Percentage of stocking at beginning of second growing season.	67.
Percentage of stocking at beginning of third growing season.	72.

Regeneration Ledger.

Clear-felling (Experimental) Working Circle.

Analysis of costs (1936–37 account).

Reserve—Megani Valley.

Month.	Cost of operations.															Monthly rainfall in inches.	Remarks.
	Clear-felling.	First burning.	Heaping and reburning.	Aligning and staking.	Pitting.	Seed.	Nursery.	Dibbling (original).	Stump-planting (original).	Replacement of casualties.	Soil-working, wedding and tending.	Fire-protection.	Inspection paths.	Other expenditure.	Monthly total.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.		
Total ..																	
Cost per acre.																	

	RS. A. P.
Total cost during the year 193	
Average cost per acre	
Total cost at the end of the year (including previous expenditure).	
Average total cost per acre ..	

Nursery Ledger.

Clear-felling (Experimental) Working Circle.

Year.
Number of beds.
Whether new or old nursery.
Estimated number of seedlings/stumps required.
Actual number of seedlings/stumps produced.

Number of beds sown.
Quantity of seeds used.
Method of sowing.
Method of raising stumps.
Number of transplant beds.
Espacement of transplanting.
Remarks on stocking.

Year and month.	Clearing and burning.	Uprooting stumps.	Fencing.	Formation of beds.		Cost of seed including treatment.	Sowing	Watering	Tending and soil-working.	Transplanting in nursery.	Preparation of stumps.	Number of stumps prepared.	Other items of expenditure.	Remarks.
				Original.	Re-forming.									
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.		RS. A. P.	
1932.														
May														
June														
July														
August														
September														
October														
November														
December														
1933.														
January														
February														
Total ..														

Grand total—Rs.
Total cost per 1,000 stumps—Rs.

Disposal of plants and cost.				
Species.	Where used.	Number.		Cost.
		Stumps.	Seedlings.	RS. A. P.

Ledger for Artificial Regeneration.

Plantation Working Circle.

1 Date of timber felling.
2 Date of clearing undergrowth.
3 Date of sowing or planting.
4 Species planted.
5 Espacement.
6 Preparation of soil.

Reserve

Subordinate in special charge.
Wages of coolies.

Month.	Abstract of cost.													Total cost of each month.	Percentage of stocking.
	Aligning and staking.	Pitting.	Cost of seed or nursery.	Dibbling original	Stump-planting original.	Planting original	Replacement of casualties.	Weeding.	Soil-working.	Removal of low shade.	Removal of top canopy.	Fire protection.	Miscellaneous.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS A. P.	RS. A. P.	
Total ..															
Cost per acre.															

Cost for the year 1932–33 .. ..
Total cost including previous expenditure ..
Average cost per acre .. ..

Control Book.

Fuel Working Circle.

Prescriptions of working plan.					Results of operations.							
Year.	Locality to be exploited.			Nature of work.	Year.	Locality exploited.			Work done.	Yield.	Selling price.	Remarks.
	Reserve.	Coupe number.	Area in acres.			Reserve.	Coupe number.	Area in acres.				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8	(9)	(10)	(11)	(12)	(13)
						Kadike Felling Series.						
1932–33 ..	Kadike ..	I	76	Simple coppice ..	1932–33.	Kadike ..		76	Simple coppice ..	Contractor's figures. Timber. Xylia, 150 cubic feet. Terminalia paniculata, 200 cubic feet. Fuel, 608 chowks. Bamboos, 120. Brushwood, 11 cart-loads.	Rs. 32 per acre. Total—Rs. 2,432.	Indicator area, 1 acre = Timber 12 cubic feet. Fuel, 7 chowks. Therefore total for the coupe— Timber 912 cubic feet. Fuel 532 chowks.
1933–1934.												

Record of Works.

Fuel Working Circle.

Kadike Felling Series.

Prescriptions of the working plan.					Result of operations.						
Year.	Reserve.	Coupe number.	Area in acres.	Nature of work.	Year.	Reserve.	Coupe number.	Area in acres.	Work done.	Cost.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					A. Measures prescribed.					RS. A. P.	
1933–34 ..	Kadike ..	I	76	Climber-cutting	1933–34.	Kadike ..	I	76	Climber-cutting ..	38 0 0	
1933–34 ..	Kadike ..	I	76	Regeneration in blanks ..	1933–34.	Kadike ..	I	76	*Regeneration*—Hopea wightiana, Terminalia tomentosa—8 acres.	42 0 0	
1933–34 ..	Kadike ..	I	76	Cleaning	1933–34	Kadike ..	I	76	Cleaning and weeding ..	148 0 0	

B. Measures suggested.

C. Measures neither prescribed nor suggested but carried out.

Control Book.

Cutch Working Circle.

Prescriptions of working plan.						Operations carried out.							
Year.	Coupe number.	Name of taluk.	Name of village.	Nature of felling.	Yield in number of trees.	Year.	Coupe number.	Nature of felling.	Name of taluk.	Name of village.	Number of trees marked.	Price obtained.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
						Felling Series B.						RS.	
1932–33 ..	I	Coondapoor.	Shirur ..	Selection.	2,550	1932–33 ..	I	Selection.	Coondapoor.	Shirur ..	2,300	3 per acre.	

Record of Works.

Cutch Working Circle.

Felling Series A.

Prescriptions of working plan.					Result of operations.						
Year.	Reserve.	Coupe number.	Area in acres.	Nature of work.	Year.	Reserve.	Coupe number.	Area in acres.	Work done.	Cost.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					A. Measures prescribed.					RS. A. P.	
1934–35 ..	Guruvanacote.	I	601	Climber-cutting and freeing.	1934–35.	Guruvanacote.	I	601	Climber-cutting and freeing.	68 0 0	

B. Measures suggested.

C. Measures neither prescribed nor suggested but carried out.

Regeneration Register.

Cutch Working Circle.

Coupe number.
Area in acres.
Description of the locality.
Espacement.
Method of regeneration.

Date of sowing.
Year of plantation.
Date of removal of overwood.
Subordinate in charge.
Percentage of stocking—First year.
Second year.

Year and month.	Analysis of cost.											Total for each month.	Remarks.
	Line cutting.	Aligning and staking.	Preparation of patches.	Sowing.	Replacement of casualties.	Weeding and soil-working.	Fencing.	Fire-protection.	Cost of nursery.	Removal of overwood.	Miscellaneous.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	

Control Book.

Sandal Working Circle.

Prescriptions of working plan.						Operations carried out.							Remarks.
Year.	Coupe number.	Name of taluk.	Name of village.	Nature of felling.	Yield.	Year.	Coupe number.	Nature of felling.	Name of taluk.	Name of village.	Number of trees marked in each village.	Yield of heartwood obtained.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
					QR. LB.							QR. LB.	
						Felling Series I.							
1932–33 ..	I	Karkala ..	Tenkamijar.	Selection fellings of all trees over 10 inches in girth and all dead trees.	160 0	1932–33 ..	I	Selection as per column (5).	Karkala ..	.. Tenkamijar ..	28	7 0	
			Iruvail.							Iruvail	115	25 0	
		Mangalore ..	Mucharu.						Mangalore ..	.. Mucharu	56	15 0	
			Kompadavu.							Kompadavu ..	46	10 6	
			Badagapadavu.							Badagapadavu ..	210	52 8	
			Karpe.							Karpe	110	30 6	
			Mudaperar.							Mudaperar	65	20 4	
										Total ..	630	159 26	

Record of Works.

Sandal Working Circle.

Range.—

Prescriptions of working plan.				Operations carried out.					
Year.	Reserve.	Compartment number.	Nature of work.	Year.	Reserve.	Compartment number.	Nature of work.	Cost. RS. A. P.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A. Measures Prescribed.									
1932–33 ..	Savanthagudde ..	I	Establishment of six propagation centres, 10 feet diameter each.	1932–33 ..	Savanthagudde ..	I	Established six propagation centres, 10 feet diamater each.	Nil.	
B. Measures suggested.									
C. Measures neither prescribed nor suggested.									

Strip Regeneration Ledger.

Sandal Working Circle.

Range.
Locality.
Area regenerated.

Name of subordinate in charge.
Number of strips in regeneration area.
Average length and width of strips.
Total number of stakes in regeneration area.

		Operations carried out.				Results obtained.												
										At beginning of second monsoon.				At beginning of third monsoon.				
											Number of successful stakes.				Number of successful stakes.			
Year.	Serial number.	Nature of operations.	Date.	Rate of coolie wage.	Cost.	Origin of seed.	Date of first germination.	Date of completion of germination.	Number of casualties replaced.	Date of enumeration.	Sandal.	Host.	Average height of sandal seedlings.	Date of enumeration.	Sandal.	Host	Average height of sandal seedlings.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
					RS. A. P.													
	1	Demarcation of coupe ..																
	2	Cutting strips																
	3	Piling slash																
	4	Burning slash..																
	5	Collection of stakes																
	6	Soil-preparation and staking.																
	7	Sowing sandal and hosts .. [Name of hosts to be specified in column (19).]																
	8	Blocking strips with piled slash.																
	9	Replacement of casualties ..																
	10	Tending (if any) ..																

Record of Works.

Minor Produce Working Circle.

Year.	Kinds and quantities of minor forest produce collected.		Total revenue for the division.	Remarks.
(1)	(2)		(3)	(4)
			RS. A. P.	
1932–33 ..	Honey	80 tins.	3,800 0 0	Forty-two farms were put up in auction but only 36 were sold.
	Wax	100 lb.		
	Canes	120 cart-loads.		
	Gallnuts	10 maunds.		
	Shigekoy	80 bags.		

Miscellaneous.

Record of Works.

Prescriptions of working plan.			Works carried out.					Remarks.
Year.	Nature of work.	Details of work.	Year.	Nature of work.	Brief details of work.	Cost of each item.	Total cost of each work.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
						RS. A. P.	RS. A. P.	

APPENDIX III.

Maps.

The following maps have been drawn to accompany the working plan :—

One combined Key map for both North and South Mangalore Divisions on a scale of four miles to an inch showing the constitution of the working circles. Stock maps showing vegetational types on Survey of India Sheet Nos. 48 K/9 N & S, 48 K/10 N, 48 K/13 N & S, 48 K/14 N & S, 48 K/15 N & S, 48 K/16 N & S, 48 O/2 N & S, 48 O/3 N & S, 48 O/4 N & S and 48 P/1 N (Total, 18 sheets). One detailed map on a scale of 16 inches to 1 mile for the Clear-felling Working Circle. Detailed maps on a scale of 4 inches to 1 mile for the Timber, Fuel, Sandal and Plantation Working Circles (Total number of detailed sheets, 15).

One complete set of maps will be supplied to each of the following officers :—

The Chief Conservator of Forests	One set.
The Conservator of Forests, VI Circle	Do.
The Conservator of Forests, III Circle	Do.
The District Forest Officer, North Mangalore	Do.

No.
16749

Proceedings of the Chief Conservator of Forests

Proceedings No. 490, Press, 1st November 1933

Working Plan—North Mangalore Division—Sanctioned.

A. Wimbush, Esq., I.F.S.,
Chief Conservator of Forests.

Read—the following paper :—

From the Conservator, Working Plans Circle, No. A. 879/29, dated 17th April 1932, forwarding the Working Plan for the forests of the North Mangalore Division.

Proceedings—No. 490, Press, dated 1st November 1933.

Sanctioned.

A. Wimbush,
Chief Conservator of Forests.

To the Conservator of Forests, Working Plans Circle.
,, Conservator of Forests, Ootacamund Circle.
,, District Forest Officer, North Mangalore.

Copy to the other Conservators and District Forest Officers.
,, Principal, Madras Forest College.
,, Provincial Sylviculturist, Ootacamund.
,, Working Plans Officers.
,, President, Forest Research Institute, Dehra Dun.

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